

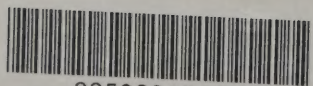


House of Commons
Science and Technology
Committee

**Research Council Support
for Knowledge Transfer**

Third Report of Session 2005–06

Volume II



22502916146



House of Commons
Science and Technology
Committee

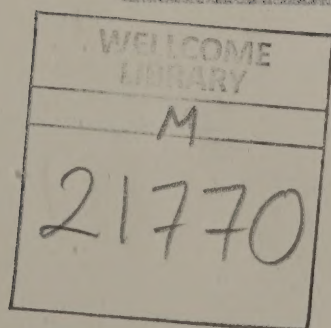
Research Council Support
for Knowledge Transfer

Third Report of Session 2005–06

Oral and Written Evidence

*Ordered by The House of Commons
to be printed 6 June 2006*

20 JUN 2006



HC 995-II

Published on 15 June 2006
by authority of the House of Commons
London: The Stationery Office Limited
£18.50

The Science and Technology Committee

The Science and Technology Committee is appointed by the House of Commons to examine the expenditure, administration and policy of the Office of Science and Innovation and its associated public bodies.

Current membership

Mr Phil Willis MP (*Liberal Democrat, Harrogate and Knaresborough*)(Chairman)

Adam Afriyie MP (*Conservative, Windsor*)

Mr Jim Devine MP (*Labour, Livingston*)

Mr Robert Ffello MP (*Labour, Stoke-on-Trent South*)

Dr Evan Harris MP (*Liberal Democrat, Oxford West & Abingdon*)

Dr Brian Iddon MP (*Labour, Bolton South East*)

Margaret Moran MP (*Labour, Luton South*)

Mr Brooks Newmark MP (*Conservative, Braintree*)

Anne Snelgrove MP (*Labour/Co-op, South Swindon*)

Bob Spink MP (*Conservative, Castle Point*)

Dr Desmond Turner MP (*Labour, Brighton Kemptown*)

Powers

The Committee is one of the departmental Select Committees, the powers of which are set out in House of Commons Standing Orders, principally in SO No.152. These are available on the Internet via www.parliament.uk

Publications

The Reports and evidence of the Committee are published by The Stationery Office by Order of the House. All publications of the Committee (including press notices) are on the Internet at www.parliament.uk/s&tcom

A list of Reports from the Committee in this Parliament is included at the back of this volume.

Committee staff

The current staff of the Committee are: Chris Shaw (Clerk); Celia Blacklock (Second Clerk); Dr Hayaatun Sillem (Committee Specialist); Dr Anne Hicks (Committee Specialist); Ana Ferreira (Committee Assistant); Robert Long (Senior Office Clerk); and Christine McGrane (Committee Secretary).

Witnesses

Wednesday 15 March 2006

Page

Professor Sir Keith O’Nions, Director General of the Research Councils,
Office of Science and Technology

Ev 1

Professor Christopher Snowden, Vice-Chancellor, University of Surrey,
Professor Diana Green, Vice-Chancellor, Sheffield Hallam University and **Dr**
Bob Bushaway, Chairman, AURIL Council

Ev 10

Wednesday 29 March 2006

Professor John Murphy, Chairman, **Mrs Barbara Doig**, Member, and
Professor Richard Brook OBE, Member, External Challenge Panel

Ev 16

Sir John Chisholm, Executive Chairman, QinetiQ Group plc, **Dr Malcolm**
Skingle, Director, Academic Liaison, GlaxoSmithKline, **Tony McBride**, CBI
(Confederation of British Industry) and **Dr Ian Ritchie**, Technology
Entrepreneur, Coppertop

Ev 25

Wednesday 19 April 2006

Professor John O’Reilly, Chief Executive, Engineering and Physical Sciences
Research Council, **Professor Ian Diamond**, Chief Executive, Economic and
Social Research Council and Chair of Research Councils UK Executive
Group, **Professor Keith Mason**, Chief Executive, Particle Physics and
Astronomy Research Council and **Professor Philip Esler**, Chief Executive,
Arts and Humanities Research Council

Ev 32

Written Evidence

1	Office of Science and Technology, Department of Trade and Industry	Ev 49
2	Research Councils UK (RCUK)	Ev 53, 145, 165
	Arts & Humanities Research Council	Ev 62
	Biotechnology and Biological Sciences Research Council	Ev 66
	Council for the Central Laboratory of the Research Councils	Ev 70
	Engineering and Physical Sciences Research Council	Ev 74
	Economic and Social Research Council	Ev 79
	Medical Research Council	Ev 84
	Natural Environment Research Council	Ev 89
	Particle Physics and Astronomy Research Council	Ev 94
3	Dr Dan Cornford, Aston University	Ev 99
4	Astra Zeneca	Ev 100
5	University of Surrey	Ev 104
6	Applied Research Forum for Farming and Food	Ev 105
7	Centre for Sustainable Urban and Regional Futures	Ev 106
8	Medical Research Council Trade Union Side	Ev 113
9	GlaxoSmithKline	Ev 114
10	British Pharmaceutical Industry	Ev 117
11	Campaign for Science & Engineering	Ev 120
12	Momenta (a division of AEA Technology plc)	Ev 123
13	Institute of Physics	Ev 124
14	1994 Group	Ev 127
15	CMU Universities Group	Ev 129
16	CBI (Confederation of British Industry)	Ev 130
17	QinetiQ	Ev 134
18	Association of Research & Industrial Links (AURIL)	Ev 138
19	Universities UK	Ev 139
20	Dr Ian Ritchie	Ev 141
21	Professor Diana Green	Ev 142

Reports from the Science and Technology Committee

Session 2005-06

First Report	Meeting UK Energy and Climate Needs: The Role of Carbon Capture and Storage	HC 578-I
Second Report	Strategic Science Provision in English Universities: A Follow-up	HC 1011
First Special Report	Forensic Science on Trial: Government Response to the Committee's Seventh Report of Session 2004-05	HC 427
Second Special Report	Strategic Science Provision in English Universities: Government Response to the Committee's Eighth Report of Session 2004-05	HC 428
Third Special Report	Meeting UK Energy and Climate Needs: The Role of Carbon Capture and Storage: Government Response to the Committee's First Report of Session 2005-06	HC 1036

Oral evidence

Taken before the Science and Technology Committee

on Wednesday 15 March 2006

Members present:

Mr Phil Willis, in the Chair

Adam Afriye
Mr Jim Devine
Mr Robert Ffello
Dr Evan Harris

Dr Brian Iddon
Mr Brooks Newmark
Dr Desmond Turner

Witness: **Professor Sir Keith O’Nions**, Director General of the Research Councils, Office of Science and Technology, Department of Trade and Industry, gave evidence.

Q1 Chairman: Could I first of all apologise, Sir Keith, for the slight delay to the start of this evidence session. We were talking about the closure of Sussex and the chemistry department there, and I am sure that is something that concerns you too. Can I say that this is a new approach to the way in which we are trying to scrutinise the research councils by having a thematic approach to all research councils and this runs through all eight of them. This is the first of our attempts to do this particular work in terms of knowledge transfer and we do welcome Sir Keith O’Nions to our session really to talk about the big picture of knowledge transfer and the way in which it is working throughout the research councils and later of course we will be having the research councils in themselves in order to see what is actually happening on the ground and their policies, so welcome to you. I wonder if I could start, Sir Keith, by asking you what does “knowledge transfer” actually mean to you? What is your definition of it because we have a lot of definitions of “knowledge transfer”?

Professor Sir Keith O’Nions: Well, I am very pleased that you have started on that point because of course it means somewhat different things to different people. I think in the research councils and in the Office of Science and Technology we tend to look at it in fairly broad terms to include certainly the commercialisation of new knowledge or the commercialisation of intellectual property which would be at the core of it, but also to include collaborative research between universities, research institutes and business to include movements of people, ie, transfer and secondments in either direction, and also advice and consultancy arrangements. I think the whole patch is still developing quite rapidly and I think we need to include all of those things in it and not all of them are directly reflected simply by where particular grant or contract money goes, so I tend to look at it in that broad frame and, if you are happy to do so, I will this morning.

Q2 Chairman: So do you feel that the research councils are absolutely central to that vision?

Professor Sir Keith O’Nions: Well, they play an enormously large part and, if I may with your permission, I could perhaps paint the landscape and show you where the Research Councils fit in. In effect, in knowledge transfer we are looking at a research base in this country which includes universities, research institutes, public sector research establishments; we are looking at a business and commercial world; and we are looking at knowledge transfer between them and indeed within them. Going first to the research base in the universities and research institutes, then the Research Councils are the largest providers of research funds in that area both for undertaking research and for training people; and progressively, through various schemes, promoting knowledge transfer in all the ways that I described in my broad definition at the beginning. Therefore, they are an extremely important part of it, but success is them being coherent with quite a number of other activities, funding streams and efforts both with regards to the business end of things and in the research base, which I can develop later, so yes, I think they have a very key part and quite rapidly becoming more so.

Q3 Chairman: Do you not think that there could be a more effective vehicle for actually delivering the knowledge transfer? Do you think that they are the effective brokers for knowledge transfer? Is there not a contradiction with their central mission in terms of basic research?

Professor Sir Keith O’Nions: No, I do not think there is a contradiction, but, in terms of delivering it, I think a number of things have to come into play. The central role for Research Councils is the creation of new knowledge in universities and in research institutes and it is what people do with that knowledge and the way people interact with business that is the knowledge transfer part. Now, in terms of promoting that, part of it is a cultural issue amongst the people who are creating the new knowledge in terms of how they wish to handle it, both individuals, universities and research institutes. There are specific funds going to universities through the Higher Education Funding Councils

15 March 2006 Professor Sir Keith O'Nions

and OST, which is now called the Higher Education Innovation Fund, HEIF; and I am afraid there are a lot of acronyms which maybe you are all very familiar with. Presently, we are distributing funds for HEIF3. This is money going to universities to develop the capacity to transfer knowledge and engage with business, so that particular funding supporting those activities in universities is building off the creation of new knowledge from research councils. But the research councils themselves have particular schemes, which differ significantly from one research council to another, to promote that activity and particularly in promoting research collaboration between the research base, research grants and business. This involves individuals, whether they are graduates, postgraduates, academics or senior researchers, in exchanges and collaboration with business. Therefore, I think they have an extremely important role there and I do not think it is in conflict with their role to create new knowledge. Indeed, if you look at the progress which has been made, I think in some ways it is an achievement for the UK where, if you look at our research base and universities in particular, 25 years ago they were world-class in teaching and world-class in research, and, if you look at them today, we are still improving in excellence of research against international benchmarks. There is no indication that the excellence of our teaching has declined in our major universities, but this third role of knowledge transfer and business interactions is becoming something of an engine for innovation in this country. They have taken on a third role, I think, without imperilling the other two and I think this is a huge achievement, all of which has happened in one generation and is accelerating quite fast.

Q4 Chairman: I think the question which sort of confuses me a little is that there are a lot of other organisations that are also there to actually try to pull through knowledge from our universities into the commercial sector where the DTI clearly, and you have mentioned schemes there, and the RDAs also have a role.

Professor Sir Keith O'Nions: Yes.

Q5 Chairman: What is special about the research councils that other people cannot do?

Professor Sir Keith O'Nions: Well, quite a lot. Let me go back to the original landscape. We have a research community in the universities and institutes which are funded in effect for public good, funded under the longstanding Haldane principles from 1917, going into our research base. We also have, and I think the structure is right in the UK, funding that is going into user-defined requirements supporting business with a different set of principles. The flagship of this in the DTI is the Technology Strategy Board, funding business and supporting the innovation agenda. That distinction between how funding goes in there, I think, is important and it is important that it is maintained and not confused. But, in terms of innovation, this has got to work very effectively across the top and this has got to join together because innovation and knowledge transfer

includes people moving knowledge from one place to another. Consequently, all of those major sources of funding, whether it is HEIF, research councils funding the research base, the Technology Strategy Board, MoD or Defra funding and so on or more business based, they all have a very important role to play in knowledge transfer. If one does not play the game, the efforts of another may be somewhat reduced in its effectiveness. My sense is that the structure is the appropriate one.

Q6 Chairman: Five years ago would we have even had this conversation?

Professor Sir Keith O'Nions: Not with me you would not, but I think that the conversation would have quite a different structure to it and would have probably been rather more worried about inputs and whether we are putting any money into this at all and whether the expenditure was actually happening at all.

Q7 Chairman: We are very tight on time, so can I just ask you to keep the answers as brief as possible.

Professor Sir Keith O'Nions: I was advised years ago that the best answers were long ones, but I will keep them short!

Q8 Dr Harris: The amount of your budget that goes to this is 3%, is that right, or about that, as I understand it?

Professor Sir Keith O'Nions: It is about that.

Q9 Dr Harris: My question is not whether it is 3% or not, but do you think that is going to increase or do you think it has reached its natural or, some would say, unnatural peak at 3%?

Professor Sir Keith O'Nions: Yes. Let me not get drawn into the 3%, the sort of tangible and intangible parts to it—

Q10 Dr Harris: Where we are now, is that the limit?

Professor Sir Keith O'Nions: In terms of funds that you can identify, that the community can identify, that are available for knowledge transfer within the research councils, within the higher education innovation funds of universities and within the Technology Strategy Board, what is the direction of travel of those? I would argue for each of those for which I have responsibility that they should be on an increasing trend.

Q11 Dr Harris: What is the evidence that you have or the research that you have commissioned to back up the assertion that you made just a moment ago in answer to the Chairman, that reserving money or biasing, without being judgmental in that term, allocations of money towards those applications that have obvious or likely potential knowledge transfer is “not in conflict with creating new knowledge”?

Professor Sir Keith O'Nions: Well, I agree with the last statement, but I actually did not make the statement as you have said, ie, “biasing funds towards those particular pieces of research which have applications” was not a statement I made

15 March 2006 Professor Sir Keith O’Nions

because I am not sure that is what we do and that is not what I believe in in the way that you have expressed it.

Q12 Dr Harris: So, if you can deal with the question which you are happy to answer, what is the evidence that what you are doing is not in conflict with creating new knowledge because people think that the money that could be spent purely in the pursuit of creating new knowledge empirically will suffer if you do not spend the money on doing that as the main aim?

Professor Sir Keith O’Nions: Okay, let me give you some evidence. The first thing is that on an annual basis we make available a report from Evidence that looks at the international calibre of science in the UK. I will not repeat all of the statistics, but overall we are second only to the United States in the impact of our basic research however you look at it and, in value for money terms, it is certainly the best value for money in the world and we are improving trends, particularly in biomedical sciences. Therefore, dealing with excellence of research, there is no evidence that any policy over the last decade has detracted from the improving trend in excellence of our research.

Q13 Dr Harris: Can I question that because all that shows is that it has not got worse. I am asking you how you know that it would not have done even better had we not put the money into opportunity costs, that we could not have done even better, so simply using an indirect measure like that and saying that it is still going on does not answer the question.

Professor Sir Keith O’Nions: No, with an apology, let me correct you. It is not an indirect measure, it is a direct measure and it is a lot better than any anecdotal statement you may make. This is metric-based evidence, bibliometric evidence on the impact of the most highly cited work which internationally is accepted as an important benchmark. Against those, we have improved internationally over the last decade. Now, you are asking whether we could have improved more had we done something different. Well, I think to have improved over that period of time is a huge achievement.

Q14 Dr Harris: That is what I mean.

Professor Sir Keith O’Nions: That is based on fact, not based on anecdote.

Q15 Dr Harris: We will come on to metrics actually, so we will not deal with that now, but the point I was making was that, as a measure of where the knowledge transfer is prioritising in the way we are doing knowledge transfer, saying we are still improving on what I expect are direct measurements of excellence is an indirect measure, I would argue, but the point I want to make—

Professor Sir Keith O’Nions: Well, let me deal with your second point because I would like to say what success we have had with knowledge transfer as we have improved our position in international science, and let me just give you one figure to chew on. Over the last two years, university spin-out companies

that have entered the Stock Market, their capitalisation as of February this year was £1 billion. So there is £1 billion of market capitalisation gone through IPOs from universities, in the last two years. That is a huge contribution. Your judgment is to balance the benefits of that against the world-class research of which there is really no substantial debate to be had.

Q16 Dr Harris: Assuming that is the result of your initiative as opposed to something which would have happened anyway. My last question is to come to this issue of what I describe non-judgmentally as “bias” in respect of allocating your funds to those applications. I quote, and this is your chance to correct the record, from *Research Fortnight* of 22 February: “According to sources in the two research councils, Keith O’Nions, the Director General of the research councils, said that he would like to see a peer review system that takes into consideration issues such as success in forming spin-out companies and the use of science in policy-making”. That may or may not be true, but there is a feeling out there that there is going to be a slant towards that sort of approach.

Professor Sir Keith O’Nions: Well, I think there is a feeling out there which may not be very credible. A careful reading of that article is that it is somebody who quoted somebody who quoted me saying it. So what I can say is that the best comment I heard about it is that it should get the Booker Prize for fiction, and the nicest thing I can say is that it is total tosh!

Q17 Dr Harris: And you wrote to *Research Fortnight* to make that point?

Professor Sir Keith O’Nions: I did not write to it because actually I thought it was so far removed from anything I have ever said or believe that it was not worth the stamp.

Dr Harris: Well, you have put it on the record now.

Q18 Chairman: So when PPARC actually include as part of their process the issue of knowledge transfer and spin-off, that is not in contradiction with what you have said?

Professor Sir Keith O’Nions: No.

Q19 Dr Turner: That was the very point I wanted to raise because I am learning that some of the research councils are in fact asking the applicants to indicate the knowledge transfer potential of their work at the time that they make the application before the basic research is done. Well, of course in blue skies research, you cannot always do this. There are times when you cannot tell where the next whizzy application is going to come from if you have not done the blue skies research for its own sake, so would you agree that there is a tension there and how do you think it should be controlled?

Professor Sir Keith O’Nions: Let me say that I agree with the point you make, that potentially there could be a tension there. I agree with you wholeheartedly that, when someone is engaged in pure blue skies research in pure mathematics or something

15 March 2006 Professor Sir Keith O'Nions

analogous to relativity, what applications that may have is completely unknown. For the structure of DNA in the 1950s, it was completely unknown, and you could not have predicted, that it would go into forensic science and genomic medicine. But a lot of research that is done is an application of some of those blue skies things what can be foreseen at that time, and it is particularly true in engineering subjects for example, that a potential application is foreseen, and I think that is a reasonable thing to ask. The National Science Foundation in the United States has had this as a routine part of their application for many, many years. I think it is up to the peer review panels and the peer review process to look at that and make their judgments, but I agree with you that there could be a tension if that is interpreted out there in the research community that, unless you can identify the clear application for your research, its chances of being funded are going to be very much less and that would be an unwelcome tension.

Q20 Dr Turner: Obviously applicants are either going to give the honest answer, "I have no idea at this stage", or they are going to think, "Oh, I had better think of something to put down", which may be absolutely meaningless, but they have filled in the box and I take it that you want to avoid that. However, having said that, how do you set your guidelines in asking the research councils to play their role, whatever it exactly is, in carrying forward the Government's knowledge transfer agenda?

Professor Sir Keith O'Nions: Well, I will really try to keep this short and let me just say at the beginning that I will send you some data about the performance management framework which we use which you might find interesting. The relationship between government, ie, me, I suppose, and the research councils, is through a performance management framework that specifies two broad outputs: the first is improving the international excellence of the science that we undertake in the UK; and the second output is improving the exploitation of that science for both the public good, health outcomes, national security and economic benefits. Output 2, as we colloquially call it, on exploitation, and certainly exploitation for economic benefit also has a performance management framework I have the one in front of me here for EPSRC and I am happy to send it to you. But let me just give you a glimpse of the things that are in there. In effect, we are monitoring, but we are not setting targets. This is quite a new territory to be in and we are looking quite carefully both at the scale and quality of things that are done in this area of knowledge transfer and exploitation. We are looking at, for example, the intensity and scale of company partnerships, joint collaborations, CASE studentships. We are also looking at strategic alliances involving research councils. We are looking at support, what they are spending on enterprise, and we are looking at student collaborations between business and universities. That is for EPSRC and it is broadly similar for all the research councils, but it differs somewhat according to the

character of the research councils, so for the Arts and Humanities Research Council, equally active in this area, we are monitoring some quite different things. We have been very cautious not to just set targets because, when you set targets, that is what you get. If you set a target for the number of graduate students working in the business, then that target will be met. We are cautiously, but quite actively, evolving this performance framework and the performance that we set is a very close agreement with the research councils. It is much reflecting what they believe they wish to do and can achieve.

Q21 Dr Turner: Well, it is gratifying to hear that you are evolving metrics to measure this. Now, the other metrics we have on teaching quality and basic research quality do indeed show that our universities are performing world-class.

Professor Sir Keith O'Nions: Absolutely.

Q22 Dr Turner: Can you say that we are doing that in terms of innovation and knowledge transfer?

Professor Sir Keith O'Nions: No, I do not think we are, but, in terms of where we were and the direction of travel, it is enormously impressive. I am just looking through my numbers here as I will get them wrong from memory, and I already gave the numbers on the market value of the 20 most recent spin-outs over the last two years being approved. The number of patents has increased over a decade by more than an order of magnitude as has the number of licence agreements and income. Let me just take one example of the Medical Research Council. The income it received from licences of its discoveries through MRC Technology up until last year was about £100 million more or less over the last 15 years. It has recently realised an additional £120 million simply from HUMIRA which is the monoclonal antibody drug for arthritis and psoriasis. These are really getting to be rather large numbers relative to the investment. We have a lot of statistical information on this, and I say the rate of travel is very fast. But are we best of class? Are we world-class in exploitation or knowledge transfer as we are in science? No, we are not, but I think it is right that we set ourselves the target to get there, to remain world-class in science and to become world-class in knowledge transfer.

Q23 Dr Turner: Do you think that we can approach the MIT level? Do you think that the number of little pots of funds that we have got involved in this is too many, too confusing and would it be more effective if we brought some of them together?

Professor Sir Keith O'Nions: The Chairman has fixed his eyes on me and that tells me I have got 30 seconds and no more to answer this. I believe yes and I will just give you again one statistic. Just take the Cambridge area, and this is the combined effect of having world-class universities, science parks, many years of different types of investment and venture capital involved. I will just give you the statistics. In the greater Cambridge area, there are 3,500 hi-tech companies employing 150,000 people, and you will know that the population of Cambridge itself is only

15 March 2006 Professor Sir Keith O’Nions

just about 100,000, with a commercial worth of about £1 billion.¹ These are extraordinary numbers, half of them are biotech and the other half information technology and electronics. There are very impressive numbers for the Oxford area and the Thames Valley. These are developing into clusters I think, which you can start to compare alongside MIT and what is happening in Massachusetts; it is very impressive indeed.

Q24 Dr Iddon: The regional development agencies have been given a considerable slice now of the science vote to spend.

Professor Sir Keith O’Nions: Yes.

Q25 Dr Iddon: Can you just explain to the Committee what relationships there are in this area of knowledge transfer between the research councils and the RDAs to make sure that the efforts are co-ordinated?

Professor Sir Keith O’Nions: Accepting that RDAs still come in somewhat slightly different shapes and sizes and they have quite different amounts of money to invest through their science councils and some have only come to science councils quite recently, I think you would expect the degree of interaction with RDAs to be quite variable. The interaction tends to be directly with individual RDAs, so there are some places where the interaction is deep. If we take the North West RDA and what is happening at Daresbury, there is a very close development of science and innovation in that area involving the research councils, particularly CCLRC and others within the North West RDA. There is a similar level of very high-level engagement with that same group of research councils in the Harwell/Radford/Appleton/south Oxfordshire area and SEEDA. There are numerous others, but, to deal specifically with your point and I will deal with them as a collective, that is actually harder in almost most areas of government. The research councils do sit on a Funders Forum group jointly with representatives of the RDAs where these larger issues of the effectiveness and co-funding of things are discussed, but I would say that most of their interactions are much more as individual research councils with individual RDAs. I think it is a very healthy stage, but there is enormous scope for a lot more to be done in the regions and I think in many of the things we are talking about here with knowledge transfer, the regional part of it is absolutely key, particularly with SMEs and so on, and it is not going to go any faster than the RDAs themselves develop the capacity to deal with those areas.

Q26 Dr Iddon: You must be aware that there is quite a lot of criticism from the other side of the equation on knowledge transfer and that is from the industrial side. We have had evidence from GlaxoSmithKline, for example, who have commented that, “the current arrangements for the promotion of knowledge transfer by the RDAs are not satisfactory and we consider that there are real opportunities for

the research councils to take a lead here”. Now, are you aware of those criticisms and are you talking to industry about them?

Professor Sir Keith O’Nions: Well, I am aware of the criticisms of RDAs from business and again it is highly variable. I am not sort of ducking your question, but it is not actually my job to talk on behalf of RDAs and business, though I think it is part of my job to do what is necessary to bring RDAs and research councils together where we can be extremely effective. I have named two of those and it is not an area where we are collecting metrics and so on, but I would agree that this is an area where we need to push forward further.

Q27 Dr Iddon: Another area where there is a considerable science vote to be had by universities and others is from the European Union of course. They have just established a European Research Council of course and Framework 7 is ahead of us. What kind of liaison is there with that organisation to promote knowledge transfer and indeed who would own the intellectual property rights when the very nature of the European Union requires collaboration across the Union and even without the Union?

Professor Sir Keith O’Nions: There is an awful lot to that question and some of it is harder to answer than other bits, but let me start with the first part. The European Research Council, I think, is very welcome. This will not, as I understand their emerging policy, require the sort of networks and multiple-country bids into the European Research Council. I think this will be much closer to *ad hominem* bids from particular individuals, which is extremely good news, I think, for this country and we greatly welcome that. I would hope to see the resources going into that increase quite rapidly. It puts a clear separation between what is supporting basic research through the EU, the blue sky, the basic end, vis-à-vis the much-closer-to-market type of research. The second part of your question, sorry?

Q28 Dr Iddon: I am particularly concerned about who would own the intellectual property rights with the international collaborations involved.

Professor Sir Keith O’Nions: Well, any resources that go into our university base and our research base through universities are the same basis as any other funds that come in, other than deals that may be made with business, so the IP remains within the institution and the institutions have an arrangement with individual investigators. Where business is involved, then those things may change.

Q29 Dr Iddon: To get some of these grants, you have to have international collaborators. Now, obviously there is a potential for disputes here as to where did the original idea come from, was it from Italy, was it a French collaborator or was it a British collaborator, so has this been discussed with the European body, the IPR?

Professor Sir Keith O’Nions: I think probably the proper thing for me to do here, I am inexperienced on that, I will be quite frank, but I am very happy to go away

¹ Note by the witness: These companies contribute £7.6 billion GVA to the UK economy.

15 March 2006 Professor Sir Keith O'Nions

and let you have a response on the present state of what IP relations are in a multi-country framework or what they are expected to be under Framework 7.

Q30 Mr Ffello: Just returning to the issue of the number of different schemes, the Campaign for Science and Engineering told us, for example, that, "Even within the research councils, small pots of money appear as a bewildering array of fragmented initiatives". Why are there so many different schemes for research council knowledge transfer support? What are the arguments against having fewer large schemes?

Professor Sir Keith O'Nions: The general picture makes good sense. Going back to supporting the research base, ie universities and the institutes, which is on a public good basis, following Haldane principles, versus the near market and support of business, that is a very clear and, I think, excellent way of doing business. The fact that there should, therefore, be funding streams to support knowledge transfer and innovation on both sides of the fence, as it were, also seems logical; you obviously want them to draw together furiously across the top. The fact that we have the Higher Education Innovation Fund going into universities which is the third-stream funding, I think, is logical. I think it has been extremely beneficial in developing the capacity within universities and now using a formulaic basis to have the top half a dozen universities getting around £3 million from that fund and also no university in England is getting less than £200,000. So everybody can play and, that makes good sense. The Technology Strategy Board supporting innovation and the business side, that makes sense. Then the question is: can you make the things join up across the top? Well, going back to where we came in, the research councils are the biggest funder of the research base and they have an important part to play there. I agree with you, there are quite a number of schemes and they vary according to the area, so it may look a bit confusing. I do not think at this stage, where we are still finding our way forward in these that it may be as dumb as it may look. EPSRC, the Engineering and Physical Sciences Research Council, for example, it has a £720 million budget, the biggest of our research councils, 40% of its entire budget goes to promote knowledge transfer, which is a very large amount. Basically about £130 million of it is in collaborative research with business, which is very clear, and about £60 million is collaborative training at the postgraduate level.² Now, if we go to the Arts and Humanities Research Council, the newest research council, only a year old, they are obviously spending a much lower proportion of their £90 million budget, they have moved about to £6 million, and they have got specific knowledge transfer programmes, such as

those aimed at the creative arts, the creative industries and so on. Yes, there are quite a lot of schemes, but actually it is a very complex problem, so I have some sympathy with the view, but I think that we are really moving into quite different territory. We understand funding of basic science really quite well, but this is quite different territory we are moving into and we are moving with 124 universities playing the game and a large number of research institutes. Therefore, I actually do think it is the way, but we should be looking to simplify it in the future as we understand better which of these schemes are having the biggest impact.

Q31 Mr Ffello: So are you actively reviewing the number of schemes? Is there a programme rolling forward to look at the number of schemes or is it something a bit more ad hoc?

Professor Sir Keith O'Nions: I think we might be a bit closer to creating schemes still, but I take your warning!

Q32 Mr Ffello: In terms of the individual remits and priorities of the research councils, am I right in thinking that you are satisfied that those are best served through individual programmes, that the individual remits are best served through individual programmes?

Professor Sir Keith O'Nions: At this stage, because knowledge transfer is really serving very disparate communities, a one-size-fits-all approach to deal with an arts and humanities community dealing with everything from video games to creative arts and *Shrek* and so on to nanotechnology at the other end, we do not understand any of that well enough yet to say, "Here's a one-size-fits-all for all schemes".

Q33 Mr Newmark: You have talked a lot about what RCUK is doing, but really what is their value added to research council knowledge transfer, focusing on the value added?

Professor Sir Keith O'Nions: The greatest value added of RCUK is that it brings together the chief executives of the research councils and shares best practice and in some areas it absolutely takes the lead on behalf of the research councils. On knowledge transfer, it is not at that stage. It is certainly an area where best practice is shared and I think that is wholly welcome, but RCUK is not in a position to—

Q34 Mr Newmark: Is that recognised by the user community out there or not? I know that you feel it is, but do the—

Professor Sir Keith O'Nions: Overall I think what RCUK does is understood by the user community. In terms of your specific question about what value added does, does it add to knowledge transfer, I think that everything we have talked about tells us that this is still quite deeply embedded in the communities, in the research councils that are dealing with it. RCUK is providing certainly a forum in which communication is taking place. Is it taking a leadership role on behalf of the research councils in this, as it does in science and society? No,

² Note by the witness: EPSRC's budget allocation in 2007–08 will be around £720 million. For the latest year for which a breakdown is available (2004–05), about 40% of EPSRC's budget was spent on a combination of collaborative research involving business, training, involving collaboration with business and other activities with user involvement (such as Follow on Funding and Business Plan competitions).

15 March 2006 Professor Sir Keith O’Nions

not at this stage. It would probably be fair to say that its role in this particular area is less obvious to the community.

Q35 Mr Newmark: And in the context of promoting harmonisation?

Professor Sir Keith O’Nions: Can I be clear what you mean by ‘harmonisation’?

Q36 Mr Newmark: Harmonisation between the various councils in what each of them is doing.

Professor Sir Keith O’Nions: RCUK has a key role in harmonisation, but harmonisation for me at the moment is a foot down on the accelerator towards harmonising back-office processes.

Q37 Mr Newmark: So it is more cost savings integration or not?

Professor Sir Keith O’Nions: Well, certainly it is cost savings, but the main benefit of back-office harmonisation is actually having HR, the finance activities, that sort of thing—

Q38 Mr Newmark: Saving on replication?

Professor Sir Keith O’Nions:—but actually it should be a much easier organisation for the community to deal with, common application processes and so on. It really should not matter very much whether you are applying to EPSRC or MRC, there should be a great commonality there, so actually it should make it more user-friendly.

Q39 Adam Afriyie: Sir Keith, how will metrics improve the research councils’ knowledge transfer support and how will these mechanisms improve it from the previous position?

Professor Sir Keith O’Nions: Well, I think I have already agreed that I will send you an exemplar of the EPSRC one and to note that we are looking at a basket of metrics because we think there would be a danger in actually setting a target against a particular metric. Where it will improve it at this stage without any question is actually capturing what is going on and capturing what is the time series of what is going on, what is the amount of collaborative research, how is that trend, what is the value of joint projects, how many students are working in collaboration with industry, how many exchanges are there. We are mapping those and looking at those trends through time.

Q40 Adam Afriyie: So it is at the kind of embryonic stage?

Professor Sir Keith O’Nions: Well, it is a bit beyond embryonic, it is a year old, but we are being very cautious at the moment not to say, “Look, the right target for you is to get 50% more students working in business”, because the research council would do that and, going back to a point made earlier, this may actually have an undesired consequence elsewhere. The last point I would make on your question is that I am extremely interested in how we can improve the economic impact of knowledge transfer in research councils and I have set up a committee chaired by Peter Warry who will report to

us later this summer. The terms of reference for that, if I can find my page, is basically that this is a group of people that includes, and I will happily send you the list of people, economists, people who have established SMEs and so on, is to advise on how research councils can deliver, and demonstrate they are delivering, a major increase in the economic impact of their investment.

Q41 Adam Afriyie: So is it the next step in the process?

Professor Sir Keith O’Nions: Yes, this is the next step in the process. The research councils are equally as enthusiastic that we do this, but I think this is an area where we need to move in this direction with vigour, but considerable caution.

Q42 Adam Afriyie: How do you actually see that metrics would indicate taxpayer value for money from government investment? Are we at that stage yet or is this the work you have just commissioned?

Professor Sir Keith O’Nions: This is exactly the stage we are at and, if you were the Treasury asking that question, how am I going to demonstrate that, I would respond and say that this is a very hard question and we do not have the answer to it or the metrics associated with it. This particular group being chaired by Peter Warry will be looking at those sorts of questions and I have no doubt that we are going to be looking more widely at this question really from an economics point of view during the Comprehensive Spending Review, but this is where we are at.

Q43 Adam Afriyie: In the meantime, are the metrics a proxy for value for money?

Professor Sir Keith O’Nions: They are more measures of activity, quality and directions of travel. In terms of any investment in science and knowledge transfer and whether that is a benefit in economic terms, the question boils down to success is generating growth in GDP or growth in national productivity. Finding a metric that links these sorts of investments and activities to productivity growth or GDP growth is not exactly straightforward because there are many other factors that influence that; the regulatory environment, how business-friendly government policies are, all of which will affect those outcomes, so it is quite a challenge and it is an area where naivety could get us into a great deal of trouble.

Q44 Adam Afriyie: I take it that this is where Peter Warry is doing his work and when will he actually report?

Professor Sir Keith O’Nions: He will report to me in June or July and I will send you the list of people on that. For example, it includes John Van Reenen from the London School of Economics, it will include somebody from BAE Systems and David Chiswell who started Cambridge Antibody Technologies, so it is quite an eclectic mix, but I think we need quite an eclectic mix to address this non-trivial question.

15 March 2006 Professor Sir Keith O'Nions

Q45 Dr Harris: If the metrics or whatever we have at the moment will show that things are going in the other direction, will you stop what you are doing and try something else or will you just try harder, put more money in and accelerate the increase of the funding that is going into this area? Will it affect what you do?

Professor Sir Keith O'Nions: Well, it must. At the moment at the government level a lot of attention is being paid to a surrogate measure of success which is the percentage of GDP that we spend on R&D, the 1.9% now, but can we get it to 2.5%. Now, that is the metric that is sort of being paid attention to widely across government, but, in terms of the deeper metrics, trying to reflect our success in innovation, yes, if we are not succeeding, we have to change the way we are playing the game and, if we are not succeeding, I am sure a committee like this will be taking a great deal of interest in it. However, I am very confident because the big change that is taking place is not how we are spending money, but it is the change in culture in the research base and I think a cultural change is really the trick.

Q46 Dr Harris: I am pleased you are confident and not depressed.

Professor Sir Keith O'Nions: I am always confident.

Q47 Dr Harris: The headline I think you said at the beginning was that on the citation rank where we are continuing to improve, that gave you faith that you are going in the right direction. If that tails off, ie, the increased improvement tails off, would you therefore on the same basis consider switching more money into basic research from your own knowledge transfer and let the third stream do third stream things or is that one metric which is not going to affect your activity if it heads in the wrong direction?

Professor Sir Keith O'Nions: That is a sort of hypothetical area which I am going to duck because I think it is actually quite complicated, what decisions will be made.

Q48 Dr Harris: You defended the decision to spend what you said were increasing, albeit small, amounts of your budget on this by saying, "Well, I'm reassured that things are continuing to improve on that basic, well-established measure of informative research", so does the corollary apply?

Professor Sir Keith O'Nions: It is a straightforward balance of investment. We are investing the largest part in basic research, if you like, and we are investing some of it in knowledge transfer. In terms of outputs, we are overall maintaining and improving our world-class position in science, which is not bad for 1% of the world's population, and all the measures of economic benefit are very rapidly on a positively increasing trend. I would say that the balance of investment at the moment is about right. If a political decision is made that actually we are not that bothered whether the science has a great benefit to the economy, then we will change the balance of the investment, but I would say at the moment that the balance is looking about right and we are doing pretty well in output terms on both fronts.

Q49 Chairman: Sir Keith, when Dr Iddon and I met the Chemical Industries Association, one of the criticisms that they made of the current process is that it is very difficult for industry to be able to interface with what is happening in our universities because they talk a different language.

Professor Sir Keith O'Nions: Yes.

Q50 Chairman: This issue of this criticism that research councils are focused too much on "technology push" rather than in industry on "technology pull", what is your response to that criticism?

Professor Sir Keith O'Nions: I think it is a very important point and it is one that I recognise. I think the engagement between business and universities is extremely important. If you look at the higher education statistics, and I will not try and repeat them now, but I even have them for your own constituency, by the way, but I will not bore you with those statistics—

Q51 Chairman: They are pretty good.

Professor Sir Keith O'Nions: They are pretty good and the trend is rapidly improving, but there is obviously a great difficulty for many companies reaching out into the university base and vice versa. I think our very big companies, Rolls-Royce and so on, are supremely networked. They know how to handle that and so on, but I think it is the sort of medium-sized and smaller companies which have difficulty. I will just give you two quick answers. One is that I think the RDAs have got an increasingly major role to play there in bringing universities, particularly in regions, into contact with small businesses and I think many of our universities that may run a mixed economy and not be big research-intensive universities with lots of research council funds have an extremely important role to play, particularly in a regional context in linking with businesses regionally and nationally. These are certainly two areas that I think are right on the radar screen.

Q52 Dr Turner: We have had complaints from industry that it is very difficult, that there is a lack of transparency about how research councils account for their expenditure on knowledge transfer and how, for instance, contracts with industry are priced, which is not helped by full economic costings, so do you have any plans to make this transparent so that everybody knows where they stand?

Professor Sir Keith O'Nions: Well, let me deal with full economic costing. I would hope that that is totally transparent already, even though I am well aware of concerns that are frequently expressed. The policy is also absolutely clear, but has probably not been as fully understood, and I will just repeat it. The huge benefit of full economic costs is that it is a methodology which enables universities to know actually what it costs them to run their business. In terms of how then universities price research with business, there is no mandate that they have to recover 100% of the full economic costs, 80% of them or 50% of them. The important thing is that they know what their costs are. In some instances, they

15 March 2006 Professor Sir Keith O’Nions

may well contract with business for strategic reasons in that university for something less than full economic cost and in others they may achieve more than full economic cost, but the issue is knowing their costs and having it all add up to 100% at the end of the day. Full economic costs have put a methodology in universities where frankly many did not know the real costs of their research. In terms of government policy, government policy is to pay full economic costs, whether it is from research councils or whether it is from other government department expenditures, and of course there is already an aggravation because the EU does not pay full economic costs, nor do the big medical charities, so universities have to make the decision, but, if they know what their costs are, then they can price accordingly. I think if a business thinks that the only way it can do a deal is if it pays 100% of full economic costs, that may not necessarily be the case, and a university may, for strategic reasons, charge more or less, but I know these concerns are still doing the rounds and we still are only six months into it.

Q53 Mr Newmark: How does full economic cost impact on research councils’ support for knowledge transfer? You talked about the mechanism, but what about the end?

Professor Sir Keith O’Nions: It only impacts on knowledge transfer where there are particular grants for knowledge transfer. BBSRC has follow-on grants aimed at knowledge transfer and it continues to pay the full economic costs to universities associated with those.

Q54 Mr Newmark: So, in the context of full economic costing, are UK institutions and universities likely to become less or more attractive partners for industry then?

Professor Sir Keith O’Nions: The honest answer is time will tell, and I would expect that, once things settle down, universities in the UK will continue to be hugely attractive to business because more and more that is where the knowledge-creation capacity is and where the innovation capacity is. As the vertical integration of our major companies has gone, they are increasingly dependent on the university system both here, in the United States and progressively in Japan, so I think we will have a few ripples in these first months of full economic costs.

Q55 Mr Newmark: But you do not fear that people will be going abroad as a result of this?

Professor Sir Keith O’Nions: Well, there is always a risk and we are watching it very carefully. I think the grown-up response is to say that, if there are unintended consequences of the way in which we have introduced this policy, we will face them and make adjustments accordingly, but at the moment we have to let some months go by really to see what the effects are. Overall, this is absolutely the right thing to do because this aims to sustain our universities and to

maintain them in a way that they will actually be able to engage with business and to avoid getting back to where we were 10 or 15 years ago with a hopelessly under-invested system.

Q56 Dr Turner: Do you feel the need to have someone within the research council structure, people with sufficient business expertise, to oil the wheels of knowledge transfer and do you have them?

Professor Sir Keith O’Nions: Yes, yes and yes and we need more. The chairs of most of our research councils are from business. The new appointments that I have made since I have been here have been looking for people with a great deal of business experience and business skills. That is because research councils are quite complex businesses and they need that sort of professionalism. At the moment, we are making the Chair somebody who has those skills and looking for the Council having business skills and people who know how to run an audit committee for example, progressive people who understand innovation and knowledge transfer on the councils. The chief executives of them remain largely people from an academic background. That is the user friendly and academic phase. The balance is correct. Do we need more people in this area? As we move further down this agenda and the adventure that we are on, we will need progressively more people with those sorts of skills available to research councils.

Q57 Dr Iddon: Previous research assessment exercises have been criticised for not taking into account applied research and the knowledge transfer that results from that. Do you think the 2008 research assessment exercise will meet that criticism and what involvement have you had in perhaps devising the metrics that will measure that?

Professor Sir Keith O’Nions: I am not a deep expert in the great details of how the RAE is being set up; nor am I one of the architects of it, but there is a very significant shift and it will certainly address some of the great concerns about practice based research in engineering subjects and proper clinical research as well. It will take account of evidence of business interactions and output that are not reflected within normal publications and open domain literature. That is a positive thing. Will it reward or provide an incentive for what this discussion is about? I am dubious. I think it is incomplete in that sense. If you ask me the question: should the incentivisation and reward process reflect success in this area, I believe it should. That will probably only be achievable by migrating the RAE, maybe not at the arts and humanities end but certainly at the biomedical, clinical research and physical sciences end, by moving rather more to a metric basis, to provide both the reward and the incentive which is more applicable to 2006 than 1997 when the RAE was set up.

Chairman: Thank you very much indeed. Your enthusiasm for this agenda shines through and we are very grateful for that. Thank you very much indeed.

Witnesses: **Professor Christopher Snowden**, Vice-Chancellor, University of Surrey, **Professor Diana Green**, Vice-Chancellor, Sheffield Hallam University, and **Dr Bob Bushaway**, University of Birmingham, AURIL, gave evidence.

Q58 Chairman: Can I welcome you all this morning: Professor Christopher Snowden, vice-chancellor of the University of Surrey, Professor Diana Green, vice-chancellor of Sheffield Hallam—it is nice to see you again—and Dr Bob Bushaway, from the University of Birmingham. Welcome to this session looking at the issue of knowledge transfer between the research councils and the rest of the world. We do not expect all of you to answer every question. Could we perhaps get one of you to chair the session and, as you are in the middle, Professor Snowden, that falls on you. I wonder if I could ask you briefly to give us a little synopsis of who you are and why you are here?

Professor Snowden: My own background is in both universities and international industry in the UK and the United States. Relatively recently I took up the post of vice-chancellor at Surrey and prior to that I was chief executive in a public company in the technology sector in the UK, which had originally started as a spin-out from a university. I have experience which would be relevant to today's discussion.

Dr Bushaway: I am representing both the Association of University Research and Industrial Links, which is the professional body for knowledge transfer practitioners in UK universities, as well as my experience as director of research and enterprise services at the University of Birmingham, which is one of the major stakeholders of the UK research councils obtaining about eighth position in overall grant acquisition.

Professor Green: In addition to my role as vice-chancellor, my background is I have not spent all my career in higher education. For six years I was an adviser to the Department of Trade and Industry on industrial development so I have an academic and longstanding interest in this area. I am also here representing Universities UK. I am a member of the Business and Industry Strategy Group which in particular focuses on knowledge transfer and relationships with business. This agenda of research and its translation in terms of knowledge transfer is central to our mission so I have another interest in that sense.

Q59 Chairman: What do you think should be the role of the research councils in delivering the government's knowledge transfer agenda? Are they central to it or could it be better done by someone else?

Professor Snowden: The fundamental role of research councils is to fund the core research activity that goes on in universities and associated institutions. However, I think it is extremely important to recognise that a key element of that is to help facilitate the knowledge transfer process. In other words, I think it is important to look at how you can initiate that transfer from the research activities in universities into industry, SMEs and other organisations external to that. I do not think you can simply neglect the fact that research councils

have a fundamental role to play in that. Exactly how far that is taken depends a little bit on the nature of the research being exploited and the area that is in.

Q60 Chairman: Do you think they should put more emphasis on knowledge transfer?

Professor Snowden: Some of the research councils already do put a high degree of emphasis on knowledge transfer.

Q61 Chairman: Like?

Professor Snowden: An example I would give is that if you are in industry one of the most important areas of knowledge transfer is the people. If we look at, for example, the CASE schemes which have been running for many years and are still very popular today, the knowledge transfer partnership schemes which have been very successful—and as an example you started off citing the issue of chemistry—at Surrey we have had four Knowledge Transfer Partnerships in the last four years in chemistry which have been very successful. That is an example of how to help sustain important areas of activity successfully. If we look at other areas, there is a greater interest now in embedded activities where, for example, companies can embed small teams in universities. That is a relatively new process but one which we would all welcome because it allows real interaction in a very successful environment.

Chairman: Is it knowledge transfer that saved your chemistry department? I do not want you to answer. It was a facetious comment.

Q62 Dr Harris: You said it is about people. If a large number of university researchers go into industry, is that therefore, on that measurement, a good thing?

Professor Snowden: I think it would be a good thing because today we now see a greater level of exchange. In other words, researchers do go into industry and they often come back from industry.

Q63 Dr Harris: Do they?

Professor Snowden: Yes, they do.

Q64 Dr Harris: I think there is good evidence that universities are not retaining good research staff.

Professor Snowden: In some areas that is correct but at the same time let me emphasise that you have to fundamentally ask what are we here to do. The flow of good researchers into industry must surely be regarded as a success as well. Some of those very successful researchers do come back to universities and add a great deal in value in that process.

Q65 Dr Harris: There is data on people taking a pay cut to come back from industry into academia?

Professor Snowden: I did.

Q66 Dr Harris: You are a very good person but that is what we would call a small sample size.

Professor Snowden: I cannot point you to a specific study in that respect but I can point you to many examples in real life that would illustrate that.

15 March 2006 Professor Christopher Snowden, Professor Diana Green and Dr Bob Bushaway

Q67 Chairman: In terms of this general issue of the research councils' role in knowledge transfer, do either of your colleagues have anything to say?

Professor Green: It is dangerous to over-exaggerate the dichotomy, to assume that it is an either/or. As Sir Keith said, this is really about balance. It is entirely right and proper that the research councils should be concerned about the practical applications of the research that we are all being funded for. The argument, it seems to me, is about where that balance lies, particularly if the core issue is not the balance within that budget but the amount of funding that is available in general terms. If there is not enough to go round, it becomes much more important to argue about where the cut-off point is.

Q68 Dr Harris: It is a balance but this third stream funding and other stuff is a top slice for money that would otherwise go to the best research generally speaking in terms of responsive grant giving. Is it right for knowledge transfer to have two bites of the cherry, if you like, getting this third stream funding so-called and then getting what we just heard from Sir Keith O'Nions is an increasing proportion of research council funding when other necessary parts of scientific research activity which are not knowledge transfer but are not just pure research—like, for example, the need to communicate—are not getting their, arguably, fair share? Why should there be two bites? How can you justify it?

Dr Bushaway: If I could comment on the third stream, that is a very new development over the last five years or so and is only just beginning to see the benefit. As far as the research councils' role is concerned, I think they have always had a role to play in generating successful knowledge transfer. I would quote from a report that the research councils funded that the University of Birmingham undertook some research on, *People, Partnerships and Programmes*. It is those three things which the research council contribution is so fundamental to. The pool of knowledge that is generated in UK universities and part funded through research council grant awards is part assisted by the role that the research councils play with other stakeholders in bringing about collaborative partnership, in funding programmes. For example, the one I would cite is the longstanding Link Programme scheme which brings together on a match funding basis, research council funding and private sector funding, to pursue particular projects; and the funding through case awards and other fellowship schemes, industrial scholarship schemes, the transfer of people between industry and universities. What HEIF does is accelerate and add to the benefit of that relationship. I would not see them as mutually exclusive so that we either have one thing or the other. We need to have both. It is vital that we continue that.

Professor Snowden: You touched on this point: how do we attract staff back into academia or indeed retain them. This is precisely one of the mechanisms which allows that because a lot of our most innovative staff want to achieve that balance between being successful at enterprise and innovation whilst retaining a role in universities.

This helps facilitate the generation of new activities, new companies, whilst allowing those staff to be part of that process. It has been a longstanding desire amongst some of our very best academic staff to want to engage with business and indeed to start some of their own and this helps facilitate this in universities in a way that was not quite so easily done historically.

Q69 Dr Turner: How do you feel about the coordination between the research council support for knowledge transfer and government measures to promote innovation? Do you think it is effective?

Professor Snowden: There is still a high degree of disconnect between the very many different groups involved in this. Earlier on you were talking with Sir Keith about European funding schemes and Framework 7. I think that is a particularly good example where we nationally could make better use of the knowledge transfer element if we could connect that up with our own internal research council funding schemes and other schemes in the DTI, for example, more effectively.

Professor Green: More could be done. I am very encouraged by some of the recent progress in terms of trying to make those linkages. A case in point is the new AHRC and the extent to which it is now getting involved in knowledge transfer partnerships. It seems to me that is a move in the right direction but there is a case for more joining up. You spoke earlier again about joining up with the RDAs and there is a huge area where their purposes are different but nevertheless where there is a common purpose. There is a great opportunity for some joined up thinking. The difficulty, as Sir Keith rightly pointed out, is that the science councils in the regions have grown at a very differential rate. The one in Yorkshire has only just got off the ground. It is finding its feet so the extent to which you can form those relationships and start getting best value out of them is going to take some time to sort out.

Q70 Dr Turner: Do you think this coordination would be helped if you were to reduce the proliferation of different government and other sources of funding and support, many of which on the face of it just do not look big enough to be that effective? Do you think there are some useful gains to be made from streamlining this lot?

Professor Snowden: It is quite a difficult question to answer. In some areas, those relatively small pots of money are quite highly focused and do touch on activities that historically have not received support. They are doing a great deal of good in that respect. The question is whether we end up with getting higher gearing on this, perhaps better advantage from the way these might interact than whether they should all be put into one pot, because they often work completely independently without reference to each other, so you do not necessarily get the extra added value out of that process.

Dr Bushaway: In the week of the Cheltenham Festival, it is a case of horses for courses, exactly as Professor Snowden suggests. Over the years, through engagement with the stakeholders, the

15 March 2006 Professor Christopher Snowden, Professor Diana Green and Dr Bob Bushaway

research councils and other sections of government have listened to what is a complex relationship between the generation of knowledge and its application successfully in commercial or other social value activities. They have put in place a series of funding programmes which support that process on the so-called triple helix very successfully. I would think the real remaining problem is the complexity between the short term and the long term. Many programmes focus rightly on short term gains and yet it is sometimes quite difficult to assess where contributions are being made in research and where those gains are going to pull through in five, 10 or fifteen years. If you take any particular technology we are familiar with today and track its history to the market place, what goes into it across 20 or 25 years are some quite bizarre byways of knowledge generation that you would not at first think would be relevant, the mobile phone being a good example. I think it is important that we not only have short term gains in these programmes but longer term gains as well. One of the areas that AURIL is most concerned with is the generation of the people who have the expertise to stay with these things and take them forward into the future. We would like to see the research councils more engaged with longer term programmes, longitudinal tracking studies, for example, where people's careers take them; and this switching from industry to university to maybe a third party like an RDA or a government agency switching back into university. We do not have the information to show how that really works.

Q71 Dr Iddon: Do you think government and its agencies are putting far too much pressure on far too many academics and really we ought to be picking the winners? Ought we to be picking the academics who have the entrepreneurial ability and put probably more money into fewer projects that we feel will go straight through to the market place?

Professor Snowden: That is one of the areas I have specifically been looking at over the last nine months. I do not think you would find that there is enormous pressure on the individual academics to do that. Obviously there is at university level, to look at how you can exploit it, but there has been greater focus on looking at innovations and new companies that would have successful routes. There is a much better appreciation than there was historically on how to take that through, with the classic balance of small companies coming up with good P&Ls and running out of cash because they did not have the experience historically to manage that type of route. A much better process is engaged there. Universities themselves now generally do a much better job of managing the process of the evolution of those companies than they did historically.

Professor Green: Universities are much better at managing this area of work than they were when they first started out on this journey five years ago. It is important to remember in that respect that one of the logics of the third leg funding in the first instance was to say that this is a legitimate activity for universities to engage in. There was an aspiration that many of us would organise ourselves to

precisely identify those people who were best at operating this idea and investing in them to provide, if you like, a kind of parallel career track which recognised and rewarded performance in this area. *De facto* that has happened in many universities in a much more managed way.

Q72 Chairman: It has happened despite the research councils rather than because of them?

Professor Green: I think it has been facilitated by the research councils being more explicit about the extent to which this was a legitimate activity. It has been reinforcing.

Q73 Mr Ffello: In terms of knowledge transfer support from multidisciplinary research, can I ask what your individual experiences are of any problems in seeking that support from multidisciplinary research?

Professor Snowden: I would not say it is a problem. It is almost the opposite. There is such a strong degree of encouragement now, from within and between research councils and externally—for example, the Research Assessment Exercise which we touched on earlier—that the issue is more one now of recognising that multidisciplinary research is a natural evolution of any single area of research going forward. If you go back 10 years, universities initially struggled with the idea of how they would nucleate that because of the necessity to assign credit throughout the universities. That has largely disappeared now and interdisciplinary and multidisciplinary working now has become very much the norm and there is great enthusiasm for it.

Dr Bushaway: In our experience, the generation of knowledge works best across the borders between academic disciplines. In other words, horizontal linkages are more important than vertical linkages in many cases to subjects. I would pay tribute to the research councils' efforts to not let borders between their various remits get in the way of recognising that. I think of work, for example, in the last 10 years carried out by the BBSRC, particularly to watch the border with their colleagues in the EPSRC, so that as far as biotechnology and life sciences work in general there was no artificial barrier there that prevented good multidisciplinary work being funded. As far as commercialising, the problem is this one between short term and long term. It often takes much longer to pull through those benefits in some areas than it does in others. Some sectors of UK industry are better geared for working with universities than others. For example, the pharmaceutical industry in the UK is pre-eminent in working with universities to bring forward benefits in partnership with research council funded work; whereas in other sectors, perhaps not naming any, it is less readily forthcoming.

Professor Green: One of the most important developments recently is the extent to which the research councils have facilitated that convergence between disciplines. In passing, I have restructured my university precisely so that I can bring about some of those creative cross-overs between key disciplines. To take a particular example and

15 March 2006 Professor Christopher Snowden, Professor Diana Green and Dr Bob Bushaway

something that we have been very pleased with, the discipline hopping scheme is a very good idea in terms of bringing together with a small amount of money to really experimentally look at some of the benefits. We have one in my institution that brings together people from the material science area with people in the biomedical area, which is producing some wonderful elements. Similarly, a very good example we have is that my faculty of health is working with people in engineering, again with an MRC funded project. There are some real possibilities, both in terms of basic research and also its applications that can come out of this, and I welcome the extent to which the research councils are encouraging this work.

Q74 Mr Ffello: It sounds as though the current structures are working well. Are there any specific or immediately obvious improvements that you can think of that would make them work even better?

Dr Bushaway: From my viewpoint, it is the supply of a new type of individual working in research, in industry, in universities, with research councils, with other funders. We need to do more to generate this kind of multiskilled, entrepreneurial scientist and researcher. It seems to me that those silent voices that are calling for UK government to withdraw from this area are making a fundamental mistake because we must keep up this supply. AURIL, for example, has a thriving CPD scheme attracting individuals from all over the sector and is behind an initiative to establish an institution of knowledge transfer to provide standards for this area. We hope that the research councils might join with initiatives like that and perhaps support them into the future.

Professor Snowden: Often with multidisciplinary work you need some elements of seed funding and pump priming to get the project area going because there will be both equipment and space requirements that are not easily met from the conventional budgeting in universities. At the same time, it is almost a precursor to successful grant application because of the very fact that it is multidisciplinary. That is one of the harder parts for universities to address today.

Q75 Mr Newmark: Do you think research council information regarding transfer of funding is user friendly or not? The reason why I ask that is that there seems to be some confusion amongst some academics about the various schemes on offer.

Professor Snowden: It varies from university to university and also from research council to research council. There is a great deal of information available and I think it relies on the university having the infrastructure to help academics understand the schemes that are available to them.

Q76 Mr Newmark: Is the delivery of that information user friendly? Are you saying you need the mechanism of somebody within the university to educate the academics?

Professor Snowden: You need both. Some of the research councils provide it very well on-line and it is relatively easy to find, whilst in other cases it is less

so. Again, for many academics with a traditional background, this is still a relatively new track for them to follow so they do need encouragement and, in some cases, guidance. I would emphasise that is something that universities are engaged in. For example, in terms of staff development, that is an element being addressed in most universities today.

Q77 Mr Newmark: From your perspective, what value added is there by the presence of RCUK in terms of research council support for knowledge transfer?

Professor Green: We welcome the impact. Sir Keith was, I think, modest in terms of the impact that already RCUK has had. There is already an emerging much more strategic approach which is extremely helpful. I think he was correct in that more needs to be done but I think the effect has been beneficial.

Dr Bushaway: I do not think there is a role for extending the remit in the sense that what you might be suggesting is that UK research councils should hold the ring between the industry/university interface. I think that would not be a valuable way forward. Whenever there have been hints of that in the past, it has led to over-complexity, over-bureaucratisation of what needs to be a very flexible and light-footed interface, if you can have a light-footed interface.

Q78 Chairman: It works pretty effectively in the States, having a single research council or the equivalent of that does all its work. Why should it not in the UK?

Dr Bushaway: That is another argument, whether the boundaries are right around the research councils. On occasion, you have looked at that question in the past and I think it is kept under review, rightly so, because what might work in one decade may not be reasonable for another.

Professor Snowden: Having worked in the States in a university and in a company, it works well there because it is relatively simple. That is the key to success here too. If we had to have a multi-tier structure where it filtered from the top down to another research council to then try and interact with a company, I think industry would find that uninteresting and prohibitive because of the effort they would have to put in.

Chairman: A single research council would make it dynamic.

Q79 Mr Newmark: I am assuming, in the absence of that, it would be fragmented and inefficient. Nobody would facilitate matters.

Professor Snowden: What we have today is a not unsuccessful system. It has a benefit that it is focused in relative areas of expertise. For example, in the Arts Research Council it is very different to things you would do in the EPSRC. It has evolved quite successfully. I could cite many examples where that works well today.

15 March 2006 Professor Christopher Snowden, Professor Diana Green and Dr Bob Bushaway

Q80 Adam Afriyie: What is your view of the new research council metrics for measuring knowledge transfer?

Professor Snowden: First of all, I do not think the metrics today are transparent enough to us all, as a starting point. Secondly, the metrics seem to me to be relatively short term. The UK is very good at generating spin-out. It generates per head more spin-outs than the United States, but of course not all of them go forward to be successful. From your own background, surely you appreciate that that is the case because they run out of money. The question is what, from the country's point of view, surely must be a number of successful spin-outs and the eventual transfer to the economy of that knowledge ought to be the measure. Also, it tends to focus quite understandably on hard, tangible items but people transfer is extremely important. That is one of the biggest drivers. When I worked in the United States, we were actively trying to recruit Europeans because we could not get enough people into the industry there. It illustrates how important that element of it is.

Professor Green: One of the very successful Cinderella measures is the knowledge transfer partnerships. The metrics for those are very appropriate in terms of the intervention. We all know that when they are successful history demonstrates that they have had a very transforming effect in the short term on those companies. What we do not do is any systematic tracking through of the impact over time to try to see what the combined impact of all those interventions is. Many of us would be very interested in seeing the benefit to society and the economy of those interventions in the long term.

Professor Snowden: I have a quotation here from a small company. It says, "In a small company there is not the luxury of separate R&D departments. This can be our role particularly for trying out blue sky ideas." In other words, how would you measure that, because they are saying the value of the KTP is enormous in terms of what it brings to it. That is hard to give a measure of.

Q81 Adam Afriyie: It sounds like you are recommending an additional metric or maybe one or two additional metrics. Have you made any submissions about which metrics you would like?

Professor Snowden: We did respond initially.

Q82 Dr Harris: One of the metrics of the EPSRC output framework on scale is people exchanges between science and engineering base and users. "PhD career trajectories % of ex-PhD students that take up employment in industry . . ." and "Research career trajectories % of ex-research staff that take up employment in industry . . ." It is a little one way. If you use that as the metric, what happens? That has happened in chemistry in Sussex and will be seen as a great success for the health of chemistry in Sussex as all its research and teaching staff leave that department to go and work wherever. Would you

agree with me that one has to be a little sophisticated and not talk about anecdotes, whether it be yourself or other people you know further down the path?

Professor Snowden: Absolutely. I would go further and say that knowledge transfer is not a one way process. There is a temptation to focus on that being the case. For this system to be healthy, it is extremely important that there is flow back from the partners who are working in the universities.

Dr Bushaway: It is not only not one way; it is not linear. It does require a feedback loop all the way through.

Q83 Dr Harris: It is not measured?

Dr Bushaway: Exactly.

Q84 Dr Harris: You heard the earlier exchange. If the RAE is measuring something different and yet there is pressure to do knowledge transfer, what difficulties does that create for universities in worshipping two gods, as it were?

Professor Green: Profound difficulties. It is one of the things we have to manage. I will give you a parallel. One of the difficulties you have as a vice-chancellor is getting the right balance between investing in undoubted success to ensure that it maintains world class success and recognising the green shoots and possibly some of their applications nearer to home. It is a constant struggle to do that. One of the things that makes it doubly difficult is that all the metrics in terms of driving the money are those to do with RAE metrics. If you want to get grants or access to funding from some schemes outside the research councils, the metrics for access to those are also based with the RAE. To take a particular example, the very successful Centres of Industrial Collaboration that Yorkshire Forward operates, you can only get access to those if you have a certain standard. You have to be grade four or above, which is fine but those are the only metrics that are available. Those are the only metrics that our staff understand. If we want to do something more substantial, we need to develop some other metrics that demonstrate that knowledge transfer is a related and acceptable career track for individuals to pursue.

Professor Snowden: If you go back to the early RAEs, they were truly dreadful in recognising industrial participation and applied research. There has been a genuine effort to try and address that in terms of the RAE process, but the problem is you have to look at what the consequences are and the output, because it is so divorced from the knowledge transfer process. If you talk to most major companies in the States and say, "Which departments would you want to work with in the UK?" they will say in today's terminology, "The fives, the five stars and perhaps some fours." There are no expressions saying, "Some of those ones and twos are really good at knowledge transfer" which they may well be. Indeed, I would cite a number of universities where I know that to be the case. The problem is you have natural polarisation and selectivity occurring in terms of knowledge transfer as well, which is not necessarily based on a measure

15 March 2006 Professor Christopher Snowden, Professor Diana Green and Dr Bob Bushaway

of the knowledge transfer process but really on the esteem of the research that comes out of the RAE assessment, so it will continue to polarise.

Q85 Dr Turner: How easy have you found it to access research council funding for knowledge transfer? What other sources have you used and how do they compare?

Professor Snowden: The amount of funding available for specific knowledge transfer in research councils is limited in that form but the fact that it is now a factor on the application forms in the process in the first place is positive, because some applicants do identify the need for funding to interact with other companies and other agencies, including patent funding, for example. It is now no longer disallowed which historically it used to be, so there is a positive element to that.

Dr Bushaway: Over the years we have sought from the research councils perhaps inputs of the processes of commercialisation—say patent costs and so forth—and there has been a reluctance to take that step which is probably understandable within the remits as they are currently drafted. It is difficult to see how that could be regarded as contribution towards knowledge generation as opposed to a direct benefit to the particular transfer that you are seeking to bring about. The great difficulty is trying to link that to the original research council programme that you might be arguing funded it. I can see why they would be reluctant to pick up patent costs in every case, just encouraging universities to patent willy-nilly, rather than to see through an audit process perhaps where they needed to intervene. If they take any further steps in that area, I would like to see them do it in a targeted way through some sort of audit process that would allow universities to have some cost benefits for carrying out intellectual property audits, which could then conclusively or otherwise be used to take further steps.

Q86 Dr Iddon: It is not unusual for academics to feel they have invented sliced bread again and industry does not think that they have, so a tension seems to exist between the academics' value of their intellectual property and industry's value of the intellectual property. This can lead to tension between industry and the academics. Do you think research councils have any role to play in facilitating negotiations between an academic or academics and industry where these situations arise?

Professor Snowden: What you describe is a very complex situation because the host institution has a significant role to play in that as well. My personal view would be that I would not see that as a role for the research councils precisely because I think the complexity of it is not easily addressed at that level. It needs to be addressed and is being addressed these days at the institutional level.

Professor Green: This was an issue that Richard Lambert identified in the Lambert Review. My understanding is that the toolkit that he recommended has been quite successful both for universities and small businesses in terms of reducing time and costs, but it is still a difficult area and I assume that is why the Chancellor has launched yet another review of IPR and what we do about it. I have a quote for you which I think articulates what we think is an objective which we should all be aiming for. This is from the director of education of Microsoft UK who said at a recent Yorkshire universities conference, "The UK's intellectual property regime is a critical component of our present and future success in the global knowledge economy. It must provide the optimal incentives for private industry and individuals to innovate and invest to create value while preventing excessive inefficiencies and monopoly costs which can reduce competition and impede incremental innovation." I think we all share that aim. The difficulty is how we put it into practice.

Chairman: With that question hanging in the air, we thank you all very much indeed. Professor Snowden, thank you for chairing your session absolutely brilliantly. Thank you all very much indeed.

Wednesday 29 March 2006

Members present:

Mr Phil Willis, in the Chair

Adam Afriye
Dr Brian Iddon

Margaret Moran
Bob Spink

Witnesses: Professor John Murphy, Chairman, Mrs Barbara Doig, Member, and Professor Richard Brook OBE, Member, External Challenge Panel, gave evidence.

Q87 Chairman: Good morning everyone and good morning to our expert witnesses. We will ask you, Professor Murphy, to introduce yourself and your colleagues very briefly in a second, but perhaps I could say to the assembled throng that our decision to look at Research Council support for knowledge transfer was part of a decision taken by the Committee to review and to scrutinise the work of the Research Councils using a thematic approach. This was the first of our attempts to do that work and we felt knowledge transfer was a good way to start because it did affect every single Research Council. Indeed, the work you have been doing in terms of your expert panel has been in many ways leading or mirroring what we have been trying to do as well, so we are interested in your comments this morning. Professor Murphy, could you introduce yourself and your colleagues and say what you have been up to.

Professor Murphy: I am John Murphy, University Partnerships within BAE Systems. To put that into context, we have about 60 university partners. We interact a lot with the university sector. I also chair the CBI's Inter-Company Academic Relations Group (ICARG).

Mrs Doig: When I was invited to become a member, I was a senior civil servant in the Scottish Executive, but I am now working independently as a knowledge broker in that gap between user community and the various funders of research. I am also chair of the United Kingdom Social Research Association.

Professor Brook: Richard Brook. I am theoretically retired, after a long career in contract research and development in that gap between academic research and industry. I am President of the Association of Independent Research and Technology Organisations. I have been involved with the Research Councils probably for 25 years and in various universities and I am in EPSRC's system as a peer reviewer and NERC. In my retirement, I am involved in raising finance for high-tech early growth companies and spin-outs, including those from universities.

Q88 Chairman: We are interested as a committee as to why it took you so long to produce your report. It was due in January; the draft is only just out. Why?

Professor Murphy: Initially, I was due to chair it. I then had to pull out for personal reasons, so I was not involved on the first two days when the presentations were given by the Research Councils. Co-chairs were put in place. The initial draft of the report came out around about January. Part of the

initial problem was people getting their heads around the material that was presented, to try and address the high level objectives about the scale of impact in knowledge transfer. It is a combination of things: partly the coherence of the material, so that people can get their heads around it, but also partly the availability, if you like, of free resource within a limited timescale to get some real content in the report. People on the Panel all have employment elsewhere, so you have to fit this in; some businesses are not willing to give up the free time, so people have to do it at evenings and weekends; so it has taken from December until now to get a report with some real substance in.

Q89 Chairman: Our understanding is that, whilst that seems to be a very plausible reason for the delay, you have had problems with RCUK who wanted to edit this report. Is that true or not?

Professor Murphy: There has been an element of that, yes.

Q90 Chairman: Should they be doing that, for an independent report?

Professor Murphy: One of the recommendations we have put into the report is that it should be more independent, so it has been managed to a certain extent. But what initially drove that was the accuracy of facts in the report. We were pressured to release drafts of the report to the Research Councils. I was reluctant to do this because I thought it would set too many hares running, and that is exactly what it did. You need to use an appropriate turn of language to put the messages across in an appropriate way, and by seeing early copies of the report, which essentially just contain information dumps, it just sets too many hares running.

Q91 Chairman: This is now a neutered report when it comes out.

Professor Murphy: No.

Q92 Chairman: Yes?

Professor Murphy: No. From the feedback we have got, we have taken account of inaccuracies. In fairness to the Research Councils, their main feedback has been of that type. There have been a few elements which, in my view, tended to steer the findings of the report but we have not allowed that to happen. I believe, and hopefully the Panel believes, that there are some strong messages within the report.

29 March 2006 Professor John Murphy, Mrs Barbara Doig and Professor Richard Brook OBE

Q93 Chairman: Have they not basically said that you misunderstood the terms of reference and therefore produced a botched report?

Professor Murphy: I do not think that is the case, no. There was a slight difference in approach, in terms of the Research Councils wanting our focus to be on their detailed activities, which was very difficult in the timescales, but also the Panel really wanting to address the scale of impact relating to the high level objectives. Certainly, from my perspective, to get impact on the UK economy, you have to look at scale not specific examples, and that is where we struggled.

Q94 Bob Spink: Would it be fair to say there is tension between RCUK and the Panel?

Professor Murphy: Yes, there has been tension.

Q95 Bob Spink: You said you were pressured to release early copies of the report so that they could comment on it before people saw it.

Professor Murphy: Yes.

Q96 Bob Spink: What form did that pressure take?

Professor Murphy: Just repeated requests. As I say, within the limited timescales, to get our heads around the whole process was really difficult. This was why, in the end, I backed off, because it was to improve the accuracy of facts in the report.

Q97 Bob Spink: Prior to the review, how much guidance did you get from RCUK about your terms of reference, objectives and methodology?

Professor Murphy: I think it was just one meeting we had—which was not the whole Panel. Myself and Alan Driver, the rapporteur, met with them.

Q98 Bob Spink: Who wrote the terms of reference?

Professor Murphy: RCUK, I believe.

Q99 Bob Spink: Do you believe you followed them appropriately?

Professor Murphy: We have tried to follow them, but I think you need to understand that it is an area that does not have a well-determined boundary around it. Looking at the higher level objectives around this fuzzy boundary, I suspect there may be views from the Research Councils that we have strayed over what they see as the boundary but we think impacts on the objectives.

Chairman: Could you ask the other witnesses to comment on your line of questioning?

Q100 Bob Spink: Yes, but could I just ask one question on this little bit. Were you aware at the onset that RCUK were reserving the right to amend your report or ask you to amend the report?

Professor Murphy: No, I was not aware of that.

Q101 Bob Spink: Thank you. Would anybody else like to comment on that?

Professor Brook: I think this is the first time a Panel has tried to look at knowledge transfer as an activity in this way. My own view is that you cannot apply the processes that you would apply to looking at a

research programme to the knowledge transfer activity in the same way. When we came to look at what we were required to do, as it were looking at the granularity of what they were doing, it was hard to assess the impact without going back up to what the overall strategy was. That is where I think we found we did not have enough on the overall strategy to know how well the individual granular programmes were working, so the Panel started to move its attention up the scale towards higher level strategy. I do not think that was where RCUK originally anticipated we would go, but we felt we could not do our job without doing that. I think everyone has learned a lot about what knowledge transfer is and how you do it from this exercise and I think one would do it and organise it a bit differently next time.

Q102 Bob Spink: A little tension can be very constructive at times.

Professor Murphy: Yes.

Professor Brook: Yes.

Mrs Doig: I would certainly reiterate that it was an exponential learning curve for the members of the Panel, not just about knowledge transfer but about the various disciplinary approaches and the various conjoining of disciplines which make up that whole spectrum, so I think there was a lot of ground to be cleared before getting on to the business. I would also like to draw attention to the fact that I personally was delighted that RCUK, the councils, came back and resolved factual material. Because I certainly felt I was having to comment on factual material, and obviously I only have a certain span of knowledge of the detail on knowledge transfer activities of either the ESRC, AHRC or, indeed, any of the others, so I think it was helpful to the process, to make sure there was a good factual base.

Q103 Dr Iddon: Do you think that RCUK want to paint the Research Councils in the best light or are they looking for constructive criticism? Which end of the spectrum is it?

Professor Murphy: That is a difficult one, because actually I think there is an element of both. Obviously they want to put it across in a good light, but at the same time certainly I have had feedback from different representatives of the Research Councils that they welcome constructive feedback. However, in reality, that is mixed, because we have also had some aggressive feedback on what we have put into the report.

Q104 Bob Spink: Do you feel the report remains an independent document?

Professor Murphy: I think it does, because the way we have done it, as I said just now, is to correct inaccuracies that really preserve the messages and there are some fairly strong messages in the report.

Q105 Bob Spink: What were the most significant changes, not in terms of inaccuracy—that is a given, that is fine—but philosophically, in terms of views, opinions, ideas which RCUK tried to coerce you into?

29 March 2006 Professor John Murphy, Mrs Barbara Doig and Professor Richard Brook OBE

Q106 Chairman: We think you have been beaten up, you see, around the back of the bike sheds.

Professor Murphy: There might have been an attempt to do that.

Q107 Chairman: Oh, good!

Professor Murphy: But I think we have resisted fairly well.

Q108 Margaret Moran: You have come out bruised but unbowed. How far is the difference which you have been describing to us a difference in understanding between your view and the RCUK view of what knowledge transfer is?

Professor Murphy: This is really at the heart of the problem. One needs to be very careful of putting forward today's knowledge transfer professionals because my experience is they only cover a narrow subset of the topic in its entirety and that could lead to some very significant misunderstandings. That is one of the key messages we try to get across in the report. I do not believe the Research Councils and, indeed, many people have a thorough understanding of this topic in its entirety. That is worth some attention in its own right.

Q109 Chairman: You said in the report that you had real concerns about the Research Council's visions and goals. Could you explain that? What were those main concerns?

Professor Brook: It varied from council to council, I think. This bears upon what John has just said: our view of knowledge transfer is rather wider than the view which sometimes you find in Research Councils, which is maybe more limited. I think we would say there is still a tendency to think of knowledge transfer as one way: outward, as opposed to two way: transmitting and receiving. In some places there is still a degree of conventional approach to technology transfer as opposed to knowledge transfer and the community which is being addressed is probably still largely business, whereas I think we felt there was a role for the informing of public policy and a range of other stakeholders as well as just business. Obviously the whole scene is evolving. There is an issue of perception here, in my mind, because the effectiveness with which you can transfer information and get it converted into new knowledge depends upon the perceptions of the person who is receiving the knowledge. I think that it is fair to say that probably most stakeholders' perceptions of the Research Councils will be behind where they are, so people will think of anybody, even an industrial company probably, as they were five years ago, rather than where they are now. I think there are some outdated perceptions and I think the Research Councils should look at how they project themselves and get that message across in the PR sense as well as doing programmes of actual detailed knowledge transfer from particular research programmes.

Q110 Margaret Moran: Obviously there is a diversity of organisations offering knowledge transfer support. How do you think the Research Councils compare to those other sources of knowledge transfer support? Are they delivering value for money? How would you know that they were?

Mrs Doig: Could I kick off, first of all, on the question implying a range of engagement at the public policy end, which Richard started off. I think it is fair to say that the ESRC and AHRC are at one end of that. They have more of a public policy element in their knowledge transfer activities. Key to all of this is the ESRC's role, in particular, about rolling out its knowledge transfer approach, and, indeed, the social sciences ability to assist the work of the other Research Councils and the natural and physical sciences. In particular, social science can help about communication and about understanding the cultural perspectives which Richard was alluding to and the behaviours.

Q111 Margaret Moran: I was asking more about other organisations providing knowledge transfer support rather than the councils themselves.

Professor Murphy: I can answer your question with respect to value, or at least pass comment on that. I am sure there just has to be more scope to get significant improvements in value coming out of these large investments. I think the days are gone when we can just throw £2 to £3 billion into the university sector on the basis that we hope something useful will come out of it. Right at the heart of this is freedom of research direction with funding. You hear people throw up examples that orient you to one end of the spectrum or the other, such as DNA fingerprinting, which came out through, if you like, unconstrained research that led to something very useful. But, then, if you look at something like NASA, ventures into space, there is lots of truly significant science that has come out of that directed research programme. So many people throw up examples to orient to one or other end of the spectrum. You need a balance somewhere in the middle. I think no one in business is saying that the whole budget should be directed, but business is saying that we think far too high a percentage of the budget is undirected, and that needs some careful thought if we want increased value to impact the economy.

Professor Brook: Effective knowledge transfer is very hard. The Research Councils, in my opinion, are not particularly less good at it than other organisations. I would have some criticisms in areas for improvement, but I do not think I would particularly say there was a problem other than you would find when you get any bunch of scientists working on scientific research. In the days when large industrial corporations had their own scientific research laboratories, I think you would have found accusations that those scientists were in fact more interested in going off and being interested in science for its own sake than serving the purpose of the corporation which owned them. Wherever you have scientific research in a group of people trying to

29 March 2006 Professor John Murphy, Mrs Barbara Doig and Professor Richard Brook OBE

advance knowledge in that way, I think they will be vulnerable to an accusation that they are pursuing science for its own sake rather than being directed for the purposes of wealth creation. We have this on a "UK Limited" scale here, as opposed to, say, British Aerospace or ICI (as it used to be). For effective knowledge transfer I think you probably need somebody facilitating it with a degree of neutrality. My experience is that you get the best knowledge transfer when you have somebody who can see what the transmitter is saying and how the receiver is responding, and a facilitated dialogue with somebody who is trying to help the communication and understanding is the best way of doing it, I think. Neutral management of the knowledge transfer process I think often works extremely well, as opposed to just throwing two communities together sometimes and hoping that it will happen,

Q112 Margaret Moran: You are saying that there is not sufficient in-house expertise in the Research Councils to perform the knowledge transfer as effectively as you think it could be done.

Professor Brook: I think that is true, but I would have to say that I think there is a shortage of skilled and experienced knowledge transfer people in the country as a whole. You need to go through an apprenticeship. You need to learn how to interact with a variety of different communities which have different agendas, different languages, different ways of approaching things, and that takes time. In relation to the size of the task we have, there are relatively few people available to do that.

Q113 Margaret Moran: Obviously we are being told that people expect Research Councils' support of knowledge transfer to increase as we go forward. You say that you do not think more money needs to be thrown at it. We have heard about intermediaries in this. Is there a single measure which you think would make a step-change difference as far as knowledge transfer is concerned?

Professor Murphy: One of the useful examples to look at is the university hospitals, where I think knowledge transfer takes place relatively automatically. To some extent, the medical sector is in a privileged position to have these, because you have the consultants driving the research. They are dealing with patients, they are practitioners, they are driving the research, leading research teams and passing on the knowledge, so that the whole process is closely integrated compared to other sectors. If you look at industry, then there is a big divide. To try to copy that in other sectors, then the answer has to be something to do with people flow and secondments. At the moment I think we are really only scratching the surface on moving people. We need to ramp that up significantly. It is people flow between all of the organisations involved, so that the cultures flow as well as the knowledge flows. One final point is that we cannot consider knowledge transfer without considering the knowledge creation process. Businesses like mine have invested many hundreds of millions into R&D. If you look at our

product base, it is enormous. Lots of academics heading off in all sorts of directions, like headless chickens, whether or not their research output will fit into what we have had, is highly debatable, and often we have to repeat the research in-house to make it compatible. Again, it is business engagement at an appropriate stage of the process, but that is at the research stage, not at the end of it, which is knowledge transfer.

Q114 Chairman: You paint a picture here of a *laissez-faire* process, that the Research Councils themselves do not have the relevant expertise. Indeed, some of the written evidence we have from the Institute of Physics, QinetiQ, CBI says we do not have that necessary expertise, and yet that does not come over in your report as being a major concern for you. Do we get value for money out of this, or should we look to another organisation to add to the knowledge transfer in this country?

Professor Murphy: I guess I would be disappointed if that does not come out of the report. It is definitely the case in my mind that the knowledge to do this is distributed, so the Research Councils have some of the knowledge, but there is absolutely no doubt that business also has some of the knowledge. At the hard end, in business, you have to transfer the knowledge. At the end of the day, we have to get a product out the door or a capability in place to address the markets, so we have no choice but to integrate all these research outputs into our product and sell it, so there is lots of expertise within industry and that is why I think the people flow is particularly important.

Q115 Dr Iddon: It is coming over as if there is not enough coordination between all the people involved in knowledge transfer. Have you made recommendations in your report as to how to improve the coordination of knowledge transfer specialists?

Professor Murphy: We have certainly put that message in the report but I do not think we have said how to do it. I was at an event earlier this week on the same topic, where a representative of the Russell Group said: "The UK system is a mess."

Q116 Chairman: They always say that.

Professor Murphy: Also he said that it is far easier for UK universities to team up with non-UK European universities. This is just the funding mechanisms driving it. Really he was saying the EU programmes drive the linkage between universities and business better than the national programmes.

Q117 Dr Iddon: OSI (as we now have to call it, instead of the OST) is putting immense pressure on universities to go in the direction of knowledge transfer for the reasons you have rightly suggested. We have put billions of pounds into research in universities. Is there not a danger of taking that exercise too far and taking the universities away from what they are really intended to be, that is knowledge generators? Is there not some other mechanism to transfer this? Could the Research

29 March 2006 Professor John Murphy, Mrs Barbara Doig and Professor Richard Brook OBE

Institutes, for example, which many of the Research Councils have, be a bridge between universities and industry and commerce?

Professor Murphy: I think that mechanism is certainly worthy of consideration. One of the risks in driving knowledge transfer too hard in its own right is that within universities or within organisations knowledge transfer is set up as a separate entity on the side of the university and it is not fully integrated with these very special people who have the ability to create the knowledge. We want these knowledge transfer skills to be added on to the other skills; we do not want separate teams of so-called knowledge transfer specialists. I can see elements of that happening.

Q118 Dr Iddon: Have you looked at the relationship between the incubators: the excellent one in Manchester which has doubled in size on the university campus, doing very well, compared with the one at Liverpool which is struggling slightly in the bio chemistry spheres. We have this idea of spinning out companies: the academic goes into the incubator and starts a company; but there is no chance of the academic coming back into the departments, as far as I can see. Do you think we are innovative enough in the use of our academics to transfer the knowledge through incubators to industry and commerce?

Professor Murphy: Again I think there is definitely scope to improve. I am not too familiar with the examples you have quoted.

Q119 Dr Iddon: The incubators have not been part of your wider study.

Professor Murphy: No.

Mrs Doig: It is not on this particular angle, but could I register concern. There was an implication in the questioning from Ms Moran about barriers. My colleagues did not go down the route of mentioning the Research Assessment Exercise within universities and I think it is important to register that as one of the things which hold academics back, certainly at my end of the science spectrum. Even if they wish to participate in knowledge transfer they cannot do so because it does not give brownie points on the Research Assessment Exercise and that is what is driving activities within the universities.

Q120 Chairman: Will the metric 2008 overcome that?

Mrs Doig: I think it is a very slow incremental improvement and I think the problem has now been recognised. I do not know the details of the metrics, about how it will show through, but I would certainly hope so. I would like to pick up on something Richard said earlier about the complexity of the space on knowledge transfer: bridging the gap is good in certain areas but I do not think it is the answer across the whole spectrum. I think given the role of the people acting as knowledge brokers, and the context in which they are working, it cannot be a rigid environment, and there could be problems associated with measuring that.

Dr Iddon: The Government have decided to put a lot of faith into the Regional Development agencies to generate knowledge transfer and to underpin it with real money.

Chairman: We note that everybody smiled at that point!

Q121 Dr Iddon: Some are trying hard to do that. The North West, where I come from, is probably as good as any, and some of course are miles behind and do not appear to have started doing anything in this area yet. In your studies of Research Councils have you looked at interconnection between Research Councils and the RDAs? Is there any interaction? Is there a lack of coordination? What is your opinion?

Professor Murphy: There definitely needs to be an interaction and I think there needs to be more interaction. One of the key issues here is that the Research Councils—

Q122 Adam Afriyie: I am sorry, why does there need to be interaction?

Professor Murphy: I am just coming to that. For historical reasons, the Research Councils have evolved a very strong knowledge base, which the RDAs do not have. The RDAs are immature in that respect and they have to link into the Research Councils to use that knowledge base. We do it as an industry and the RDAs have to do that as well. We do put this message across very strongly.

Q123 Adam Afriyie: I would like to come to cross-council support for knowledge transfer. We have some evidence here from the 1994 Group, CBI and GlaxoSmithKline and several other sources that the coordination of knowledge transfer activities across councils is not necessarily as good as it could be. How effectively is knowledge transfer coordinated between the various councils?

Professor Brook: It was interesting that we were asked to look at the individual Research Councils only. One of our strong recommendations is that when this is done again we should include RCUK within the scrutiny, so what I am going to say is a perception not based on scrutinising RCUK but an impression. I think it could be improved. There is always this difficulty between what you impose and what you encourage people to learn from each other. I think there is a tension here between RCUK and individual Research Councils. The individual Research Councils would probably like autonomy in terms of what they do and would resist attempts from RCUK to impose, enforce or do anything from above. They do need to try to get that balance right, because I think our view was that RCUK is not being used as effectively as it might be. It requires a bit of skilled management here in order to get cross-council collaboration to be done willingly rather than being resented. I think it would be improved but it needs the right leadership.

Q124 Adam Afriyie: In effect, it was outside the terms of reference of your inquiry or report: RCUK were not examined in terms of their coordination and knowledge transfer.

29 March 2006 Professor John Murphy, Mrs Barbara Doig and Professor Richard Brook OBE

Professor Brook: That is true.

Professor Murphy: That is right.

Q125 Adam Afriyie: How effectively do the councils tackle society issues relevant to knowledge transfer? The Arts and Humanities Research Council and the Economics and Social Science Research Council understand the societal impact in terms of knowledge transfer, but how do the rest of the councils take that into account?

Mrs Doig: I can only give my personal opinion. I have not had the opportunity to look at the final report and see what the collective view is on that. I think there is a start being made but there is a long way to go. There is a long way to go to improve the original understanding of what the different sciences can offer each other. As I have already alluded to, I think there is a very important role for the ESRC to work with the other councils and to build up an understanding of what social sciences can do to spell out the social and economic context within which the sciences are operating, to help the science councils with their communication strategies on knowledge transfer, to help with the stakeholder engagement exercises which have gone on which help build society together in an understanding of the different organisations and institutions involved.

Q126 Adam Afriyie: Have you seen evidence of knowledge transfer transferring from councils, say, into government policy?

Mrs Doig: Certainly in my own area—and I think the other strand of your inquiry about scientific advice will have given these exercises—but, yes, the major research programmes with which I am certainly familiar. It is not an ideal picture. There are responsibilities on users as well, the government departments, to understand the complexity of knowledge transfer and to be able to work within the space, but, yes, examples on social deprivation, social exclusion, the regulatory ethics framework.

Q127 Adam Afriyie: I take it that has happened on a piecemeal basis rather than a coordinated approach.

Mrs Doig: You will understand I am not a civil servant now, but within government departments I think the users are shaping up to be better organised in the use of evidence and policy making. Certainly my own experience with the ESRC and AHRC, a willingness to engage with the development of the concordats, has been very important and I think that is another thing that could be explored. But what I have just said builds up to a huge agenda and there is a shortage of resources right the way along the line.

Q128 Adam Afriyie: What value do you think RCUK add in terms of knowledge transfer? Aside from their performance metrics, is there any other overarching value that you think they add in terms of knowledge transfer?

Professor Murphy: They do have the knowledge transfer group. That is working. There is no doubt that it could do better, bearing in mind the constraints that Richard has described, which really happens in any large organisation. I think the

knowledge transfer group has had a key role here, but, then, at the same time the Research Councils can act independently and there has been a clear tendency to do that.

Q129 Adam Afriyie: Coming on to performance management, in a previous leg of this inquiry we have touched on this before. What do you think of the Research Councils new performance management systems, and, in particular, the metrics that are being used? I have some here. I have some here on the output measurement: better exploitation. What is your view of these metrics in terms of assessing the performance of knowledge transfer from the councils?

Professor Murphy: I think it is a little early to decide. Metrics are extremely difficult in this area. I think the exercise to understand the impact—we are only about one year into it—needs monitoring carefully to make sure it delivers. One of the key challenges of difficulty surrounding this exercise is trying to get an understanding of the delivery of impact to UK business, UK economy. At this stage, we could not say.

Q130 Adam Afriyie: We have heard in former parts of this inquiry from somebody else giving evidence that the metrics are the first step before determining whether or not they have an impact on the outputs. They are literally measuring outputs, they are not determining what the level of them should be.

Professor Murphy: I guess that has to be the case. I think a particular issue around this is who is judging the performance. I think that needs careful consideration: that it is not done excluding UK business and that the UK business involvement tends to be managed.

Professor Brook: I think it is a very difficult area, but, at the end of the day, you are really trying to make sure that the recipient of the knowledge has received it and is happy and thinks they have got some value from it. In an ideal world, one would ask the community that is receiving the knowledge: Are you happy? Was it of value? Do you think it was well done? One would go out with a questionnaire and ask them. I think that is quite difficult to do and it may take some time, five years or 10 years, until they know whether the knowledge they received has contributed to wealth creation or a contribution to public policy or whatever. So you have to look for some intermediate indicators as to whether things are going in the right direction—which I think is what those outputs are intended to be. The danger, however, is that if you have too many metrics, people concentrate on trying to meet the metrics without thinking about the bigger picture.

Q131 Adam Afriyie: You would say the metrics will affect the behaviour of the Research Councils.

Professor Brook: They will affect the behaviour, but the law of unintended consequences says they may not do it in the way that you want. I was involved in an earlier dialogue, where I think the ideal is that people are looking for a few simple metrics at a relatively high level, where people can then use their

29 March 2006 Professor John Murphy, Mrs Barbara Doig and Professor Richard Brook OBE

judgment in interpreting how to achieve them, but the tendency, every time you try to formulate metrics, is then to produce more and more of them at a more detailed level, and the whole thing becomes a handle-turning exercise, with people looking to satisfy the individual metrics without giving enough attention to the bigger picture. I think it is an extremely difficult area, but a lot of people are scratching their heads, trying to figure out what useful metrics would be.

Q132 Adam Afriyie: Thank you very much, that is a very clear explanation of the possible impact of metrics without necessarily having a policy behind them. Can you tell us what process was followed for the creation of these metrics. Do you think the right stakeholders, if I may use that modern term, were consulted with?

Professor Brook: I am not sure I can answer that question.

Professor Murphy: I can only partly answer in that I am not sure the right stakeholders were involved in the generation of those metrics. It is the point I made earlier, that the end-user in a UK business should somehow be involved.

Professor Brook: As a general observation, I was involved in some earlier consultations on metrics. I think we then lack knowing what happened to the input on those consultations and how it was translated, and why, into the eventual output that you have in front of you. I think that is a comment that we did make in our report about, if you like, the inward knowledge transfer into the Research Councils and universities, in that industry is consulted on occasions, and rightfully so, but I think the amount of visibility that we have as to how much impact what we said has had is lacking. We were consulted, often, but we do not then know what happened and what judgments were made after that in arriving at the final policy that we see.

Professor Murphy: And that really is a general message that we would like to put forward: in that, the way that business is evolved is managed so that we are consulted and we provide input, but the net effect is the key question.

Q133 Chairman: One of the reasons we conducted this inquiry was to see whether in fact good practice in Research Council A transferred across. Do you find any evidence that Research Councils were sharing with each other ideas and best practice, particularly in view of your comments about RCUK which does not seem to have that driving force and that coordination role across all Research Councils?

Professor Murphy: There is some sharing but I think there is significant scope to improve. But there is also good reason to preserve some diversity because of the different nature of the different Research Councils.

Q134 Chairman: I am not asking for one-size fits all. I do not think any of the Committee would want that. But, if there is good practice somewhere, how

is that disseminated across the other Research Councils or is it a matter of metamorphosis somewhere?

Professor Murphy: Certainly the knowledge transfer group facilitates that, from what we can understand, but whether or not the other Research Councils pick it up is a separate question.

Professor Brook: I think they do talk to each other.

Q135 Chairman: You think they do.

Professor Brook: Well, I know they do: they look at each other's practice. I sense there would be a reluctance to copy something directly—it would be a bit infradig to do that, if I may put it that way—but I think there is a degree of competition between them, which could be healthy, to look at what this Research Council has done and then adapt it and maybe do it better. I think that degree of competition arguably encourages people to do things better each time they take an idea across, rather than to receive a standardised scheme or process which will be applied uniformly across all the Research Councils. I am sure there is that degree of competition to try to do better than other one.

Q136 Dr Iddon: Could we go back to the end users, who of course are important in all this process. You suggest that they are marginalised in the funding process and only engage once the funding decisions have been made. There are stakeholders on the Research Council boards. What recommendations have you made to improve the engagement of the end users in the funding decisions?

Professor Murphy: End users or business are involved in, for example, top and up within EPSRC, but I think that is a little bit remote from the placing investments into the universities. If you are talking about, again, the research direction, the primary investment decisions are taken and then industry is consulted but really the university has the choice to go and find which industry it wants to work with—and it may be the one just around the corner—so that they can follow their tracks. The issue is that in industry we have no choice: we have to go where the market takes us, so we have to evolve, but really the way this is all structured within the system is that the university system can be and often is highly inertial, and the academics follow their tracks, particularly driven by the RAE exercise which we have already mentioned, so somehow we have to involve that so that they can support industry that has to change with the market. My perspective is that we are consulted but really the power of the decision on which research direction is taken with the Research Council investment lies with the university.

Q137 Dr Iddon: Are you saying that the Research Councils are concentrating too much on the push and not paying enough attention to pull?

Professor Murphy: Definitely, yes.

Q138 Dr Iddon: Looking at SMEs for a moment, they have great difficulty in engaging in this process. They are about barriers, for example, like lack of

29 March 2006 Professor John Murphy, Mrs Barbara Doig and Professor Richard Brook OBE

resources or maybe even a lack of skills in some cases. How successful do you think the Research Councils have been in engaging SMEs?

Professor Brook: Certainly, speaking for EPSRC, I think they acknowledge that it is extremely difficult and that they find it very hard to do that. They have in the past looked at Faraday partnerships and other initiatives involving intermediaries to try to help them with it. I think the interaction with large companies who can afford to employ scientists clearly works a lot more easily. I think the Research Councils are improving but they are still looking for ways of interacting with the SME community. Certainly, if you take PPARC and the Kite Club—and they have contracted out that activity—it helps because you have an organisation there that understands the SME culture and mentality and also can understand the Research Council culture and mentality. In technical terms, I would regard such organisations as impedance-matching devices. You need something which will match up to the culture in the Research Councils and something that matches up to the culture in SMEs and then you get somebody to try to bridge that gap. But it is difficult.

Dr Iddon: Regional Development Agencies.

Q139 Chairman: Yes, I thought that is what they are supposed to do.

Professor Brook: I think the RDAs—and this is a personal opinion—can do some of this, they can help supporting small businesses quite well in general business skills, but, when it comes to high technology, most SMEs in technology areas will be quite specialised and sometimes the technology is quite esoteric. I think it is very hard for each RDA to have a full set of technological interfacing disciplines in their region and you may well find that the SME in one region needs to go and interact with a university department at the other end of the country, so I think expecting the RDAs to do this interfacing is quite difficult. Business links found it difficult. It is a hard job to find the right intermediary in any given technology area between that SME and that source of science.

Q140 Bob Spink: To what extent do Research Councils focus on technology push rather than technology pull?

Professor Murphy: My perspective is that there is far too much on technology push and not sufficient on pull. I think spin-outs are perhaps well served compared to supporting assisted UK industry, which needs to stay in business in the role of the markets. There are some good examples. Indeed, my organisation, partnering with EPSRC is one of those where they have responded very well to our requirements and we have got some big initiatives going across university networks. But, again, I come back to it is the scale of the activity. Testing the water, if you go around and ask people what percentage is used on technology push versus pull from business, then a typical answer that I get is 90:10. From our perspective, it needs to be better balanced than that.

Q141 Chairman: We are moving on to question 7. We have talked about the RE exercise and the problems with the RE exercise, and I think the Committee would share very strongly your comments there. Do you think full economic cost is also going to have significant impact in terms of knowledge transfer as in fact Research Councils have in fact to apply very much more of their resources to meeting the full economic costs of the projects they fund?

Professor Brook: It depends how the budgets get shared. My understanding is that there will be some budgetary transfers to permit full economic costing to be implemented without substantially reducing the amount of science that gets done. If that happens, I personally do not have too many worries. I think full economic costing is the right way to do it. If you are in business, if you operate your business on marginal costing, which is what the Research Councils and the universities have been doing, it can lead you into some major difficulties. I also think it tends to bring researchers out of universities with a false impression of what things actually cost in real life. I think the full economic costing discipline is correct. Will it impact knowledge transfer? I am not sure that I see why it should.

Professor Murphy: I would agree with that. I do not think it has to have an impact. We saw elements of the right moves. The main investment for the Research Council is that it is in research. The way research is done has a significant impact on the ability for knowledge transfer when the research outlets are produced. Some may be fit for purpose and easily adapted and some may not. FEC or not? I do not think FEC would affect that, how the research programmes are structured, how the research is done. There needs to be a lot of best practice brought into that to facilitate knowledge transfer. FEC is really a marginal effect compared to those issues.

Q142 Chairman: One thing that is puzzling us, given that Margaret was quite right, is that a lot more money has gone into the research base—and the Committee are very supportive of that—but if in fact your Committee seems to be suggesting in terms of technology pull that there should be more resources applied to applied research and, indeed, we now have the impact of full economic costing which is another cost pressure on the Research Councils, and there does not appear to be significant extra money coming in for this third-stream funding, something has to give somewhere and your report does not seem to indicate that the Research Councils themselves have thought through that particular problem. Have you?

Professor Murphy: I guess there is a strong element of truth in that. Certainly we have thought it through in terms of the 90:10 relation that I have just mentioned. I think there should be a better balance. As I mentioned earlier, I do not think you should go to one extreme or the other, but at the moment it is far too much towards one end of the spectrum than the other and far more account needs to be taken of the needs of the UK economy and UK business. A

29 March 2006 Professor John Murphy, Mrs Barbara Doig and Professor Richard Brook OBE

better balance between freedom of direction and directed research, managed directed research, I think is a key issue.

Q143 Chairman: Do you support the PPARC proposal, which says that before PPARC grant an application for a research project they require the researchers to say what might be the end result of this. Do you think that is good practice?

Professor Murphy: Yes.

Professor Brook: I have to say, EPSRC in a sense do that, because you are required to define the beneficiaries, et cetera. I guess the issue is that often some of these things are given lip service: "Here is a piece on the form that we have to fill in about beneficiaries, so we will put a paragraph in." I am not sure that is always necessarily followed through. But, yes, I think it is good practice.

Q144 Bob Spink: Should Research Councils be involved in promoting training for business skills? If so, do they do it well?

Mrs Doig: I only have a limited knowledge in my own area, but certainly the ESRC are trying to encourage PHD students, social science PHD students, organising entrepreneurial training very intensively, so I think a start has been made on that side of things.

Professor Murphy: Putting my BAE Systems hat on, we put these big requirements, footprints, in the academic sector, initially driven by research programmes. We expect those to spin off into training courses for our staff to transfer the knowledge. We also expect those to spin off into the contents of undergraduate courses, so that better skilled graduates are produced downstream. So you do need the training element closely linked to the evolving research to move the UK capabilities along within the world market.

Professor Brook: If you take industrial case studentships, for example, where there is a degree of going out and seeing industry and doing the PhD, and you complement that with some business awareness, I think that is excellent. It really depends, though, on who you are getting to do the business training. A chalk and talk session on entrepreneurialism from a lecturer is not the same as getting a real entrepreneur in to talk to the people.

Q145 Bob Spink: I get the feeling that you believe giving effective commercialisation skills is important.

Professor Murphy: Yes.

Q146 Bob Spink: Do you think the Research Councils are achieving this or do you think they have some way to go? Is this an area where they have got to put some effort?

Professor Brook: I think they have made a start.

Professor Murphy: Yes, they have.

Professor Brook: As with anything, I am sure it can be improved. I think coupling or trying to get some real people who have been out there and done it, industrial entrepreneurs, to come in and be part of the training process would be a good idea.

Q147 Margaret Moran: Coming on to intellectual property rights, there is clearly a great divergence of view as to the value of IPR and the way they are valued by the universities and the Research Councils and yourselves. What do you think to be most affected by the IPR arrangements? Do you think that the MRC arrangements should be the model that is held up as the effective use of IPR?

Professor Brook: I am not as familiar with the MRC as I am with EPSRC.

Professor Murphy: I am not familiar with MRC either. You will get a very good answer on this from the next session because of the Lambert Review. EPSRC are essentially hands-off, as long as there is an agreement in place. The way we work with EPSRC is that we put agreements in place with the university. We agree it with the university and then EPSRC are content. Across the Research Councils it is quite mixed. In some cases there are good reasons for this. Again, I think this a question of sharing best practice.

Professor Brook: IP is important. I am speaking here as someone who invests and tries to arrange investment in spin-outs, and, indeed, encouraging licensing where that is appropriate. The ownership of intellectual property is key—not necessarily for the right reasons, but an investor wants to see some protection and some intellectual property. If you are licensing, it puts you in a very much more advantageous position if you have patents and so forth. I think it is important. I think that some universities still have not got to grips with what the value of IPR is realistically and how to use it and exploit it. I think they are still going up a learning curve and there are still some considerable difficulties, but I guess we are going up the learning curve, which is helpful. When I get involved with research grants as they start up, I still often have to point out to the academics that intellectual property is important and it sometimes comes as a surprise to them that they ought to be thinking about it. But I think this is just about repeatedly getting the message across and repeatedly saying, "Yes, this is something you have to think about." But, again, of course, it can tend to conflict with the RAE.

Q148 Chairman: We will have to finish there. Could I ask for a one-word answer from you. If we were to have a Research Council in front of us, in order to look at good practice in terms of knowledge transfer, who would you say we should have definitely?

Professor Brook: I would go for PPARC.

Professor Murphy: PPARC.

Mrs Doig: I indicated earlier, in view of the centrality of the social sciences it would have to be ESRC.

Chairman: Thank you very much indeed.

Witnesses: **Sir John Chisholm**, Executive Chairman, QinetiQ Group plc, **Dr Malcolm Skingle**, Director, Academic Liaison, GlaxoSmithKline, **Tony McBride**, CBI (Confederation of British Industry) and **Dr Ian Ritchie**, Technology Entrepreneur, Coppertop, gave evidence.

Q149 Chairman: Thank you very much indeed for coming. I do not know whether all you were sat riveted to what in fact the External Challenge Panel had to say about the Research Councils. Just to repeat, we are looking across the board as to whether, in fact, the Research Councils are delivering, in terms of knowledge transfer. I think that is the question the Committee wants to know the answer to. Thank you all very much indeed for coming. I wonder, Sir John, if I could nominate you as the head of your panel.

Sir John Chisholm: What an honour.

Q150 Chairman: Seeing as you are a knight of the realm I thought that was a fitting position.

Sir John Chisholm: I was wondering when it would come in useful.

Q151 Chairman: What I would like to do is basically say could you introduce yourselves very briefly and, Sir John, if you feel a question should be diverted somewhere else, it is important that we do that.

Sir John Chisholm: I will do my best. Very quickly: I am John Chisholm and I am Chairman of QinetiQ. I guess we have been in the business of research and knowledge transfer for a little while.

Dr Skingle: I am Malcolm Skingle. I am Director of Academic Liaison for GlaxoSmithKline. Just listening to the last session I scribbled down what I am involved in, things which come up in conversation, not to show off but to show you that I am active at this interface. I sit on the BBSRC strategy board. I sit on the BBSRC appointments board where I make sure that we have an industry person on every one of the BBSRC panels and committees. I chair the BBSRC's BioScience for Industry Panel. I used to sit on the EPSRC User Panel for four or five years. I sit on the MRC Sub-Committee for Evaluation. Because I whinged so much about lack of performance I was encouraged to join the EEDA Science and Industry Council, which I now sit on. I chair the ABPI Academic Liaison Working Group. I chair the Diamond Industrial Advisory Board. I am a trustee for Praxis who train industrial liaison officers. I sit on the CBI Working Group that John Murphy just mentioned. I chaired the group that put the Lambert Agreements together. I am a peer reviewer for the EU, Wellcome Trust and Leverhulme Trust, and I see the kids every other weekend.

Q152 Chairman: I am amazed you found time to join us this morning. We are very grateful.

Dr Skingle: I felt it was important.

Mr McBride: I am Tony McBride and I am a policy adviser at the CBI on technology and innovation issues which means I look at broad policy areas including research and higher education. I am the secretary of the CBI's Technology and Innovation committee and also the CBI's ICARG Group of which John Murphy is chair.

Dr Ritchie: I am Ian Ritchie. I am a technology entrepreneur. I have started, or helped to start, over 20 technology businesses. I have been a member of PPARC and I am currently a member of the Scottish Funding Council. I have been a member of the Scottish Enterprise Board for a number of years, I just stood down in November. I am also chairman of a thing called Connect Scotland which aims to help researchers on commercialisation areas get together.

Q153 Chairman: Thank you very much indeed. My first question is I think we would all agree that knowledge transfer is absolutely crucial to the nation's economy in the 21st century. Is funding it through the Research Councils the right way forward?

Sir John Chisholm: I will start by making some comments on that. As the previous speakers were talking about you have got the pull and push issue. The Research Councils are largely invested in the push end of that, as people have said, indeed because the people who Research Councils fund are people who generally create technology and, therefore, the whole focus of that is push. Now that works differently in different parts of the science base. In the life science the invention captures much more of the eventual value of the project and, therefore, a lot of investment in invention is much more obviously connected to where the value will eventually be created from that invention. In all the physical sciences there is a much larger process to go through, the innovation process that you have to go through before you get to where the ultimate value is. That can take decades and it can go through many, many stages to get there. The pull end of it tends to be more remote from the push end of it. Therefore, my guess would be that the appropriate balance of investment will vary across the Research Councils from, in the Medical Research Council, invention being a very important part and there being a pretty close relationship with particularly the pharmaceutical industry and, on the other hand, in EPSRC that is a much more difficult arrangement to put in place.

Q154 Chairman: Ian, you have got very different membership in terms of if you are representing SMEs than the large pharmaceutical companies. Do you think the way in which we are funding knowledge transfer through the Research Councils is right?

Dr Ritchie: I think Research Councils ought to concentrate on what they do best, which is getting excellent research in the UK. I think you have to recognise that the massive majority of knowledge transfer is bright graduates going into industry. I believe 70% of Physics PhDs go into the finance sector. They are not trained to be finance people but they just seem to be bright numerate people. I think actually the Research Councils ought to concentrate on doing really tough science and getting the kids as bright as possible.

29 March 2006 Sir John Chisholm, Dr Malcolm Skingle, Tony McBride and Dr Ian Ritchie

Q155 Chairman: And not waste the money on knowledge transfer?

Dr Ritchie: I do not think it is the right place for the Research Councils to do that.

Q156 Chairman: Malcolm?

Dr Skingle: I do not think they waste the money, I think I heard them say in one of the previous committees that the level of spend is about three%; for me that is probably about right from pharma's perspective. I go along with Ian, the best knowledge transfer is definitely through people. GSK co-fund 340 CASE students, approximately 100 with the BBSRC, 100 with EPSRC and 25 with the MRC and then we have some directly with universities, the Dorothy Hodgkin Fellowship Awards for the overseas students. We get great value from these: a real win-win. The student gets access to industry to see whether they want to dip into it; the academic person also often has follow-up grants from those and frankly we get a three month to a one year interview for a person we might wish to recruit and we also keep a watching brief on developing technologies. At the other end of the spectrum we have the secondments of academics into industry, and although we have the Royal Society Fellowships and the industry interchange scheme that BBSRC have just brought in, I do not think we do enough of that. We have just recently started taking on what we call "academics in residence", to fuel certain parts of our science base. What happens is these guys come in with a perception of how we operate and once they are in they interact with our groups where we are kicking ideas around and they realise what our problems are and they go back to academia and if they cannot solve it they know someone who can. Anything which involves people transfer I think is the best way of getting knowledge transfer done.

Q157 Chairman: CBI, should we leave it to the market?

Mr McBride: We believe the knowledge transfer aspect of the Research Council's remit is well-placed and they are in fact well-positioned to carry out this function. It adds value to the research which they invest in and the teaching which HEFCE and other funding sources invest in as well.

Q158 Chairman: How do you know?

Mr McBride: Our members tell us that they are relatively happy with what the Research Councils are doing. We have put forward a number of examples of good practice identified by members of our ICARG Group. It is difficult to identify specific impacts as the previous panel indicated. This can take time to show through and the identifiers are not always agreed on by every party. In principle and in general our members believe they are doing a good job.

Q159 Margaret Moran: You will have heard from the previous session that there seemed to be consensus that the Research Councils lack in-house skills to deal with knowledge transfer and, indeed, there was an argument for intermediaries. Would

you agree with that? Secondly, if you were put in a position of saying with the amount of increasing resource that is going to go into knowledge transfer what single thing would you want the Research Council to do differently to encourage a step change in knowledge transfer generally what would you say?

Sir John Chisholm: Let me kick off. I would absolutely agree that there is a huge shortage of skills in the understanding of what makes knowledge transfer work. It is not something which can be achieved between a chairman and a vice-chancellor. Knowledge transfer occurs absolutely at the nitty-gritty level of understanding what the value is, where the model of that transfer is going to take place, the kinds of markets it has to operate in, what kinds of funding mechanisms are appropriate, what extra things need to be brought together in order to make a proposition. All those things are typically *sui generis*, they relate only to that particular circumstance. There is a lot of skill which needs to be brought into that. It is very unlikely that you will find that in a Research Council. I think the Research Councils have an important role in understanding the problem and making the resources available for it but I would say it is probably unlikely that they would be typically hugely skilled. The sort of places where such skills exist are in the venture capital industry. Big companies have the resources to do it themselves, the pharmas tend to be very good at it. BAE Systems, which one of the previous speakers came from, Rolls-Royce, those sorts of big corporations have the resources to put into it. My own company has the resources to put into it but SMEs certainly do not.

Q160 Chairman: I find that strange really, Sir John, because the panel, apart from Ian, have just said that giving the budget to the Research Councils to do this work is the right place. You are now saying they do not have the expertise in answer to Margaret Moran's question.

Sir John Chisholm: I have tried to distinguish between money, because that is where the Government happens to be spending the money—

Q161 Chairman: Does money not need to be spent on people doing these tasks?

Sir John Chisholm:—and the expertise in doing that knowledge transfer exercise, which I said is a rare skill and it exists in certain places in the economy.

Q162 Margaret Moran: Perhaps some of the others want to add to that? Could you just point to the one thing which you wish to change as far as funding of Research Councils is concerned?

Dr Skingle: I think they vary slightly. There are various types of knowledge transfer and I think that the diversity of the Research Councils, the fact that they are competing for part of the science spend, in a way is useful but I hope that this Committee will help share the good bits from each of those Research Councils mainly in respect to knowledge transfer. The EPSRC have a sector-based approach. A couple of years ago—I thought it was fairly forward sighted of them—they had someone shadowing me for a

29 March 2006 Sir John Chisholm, Dr Malcolm Skingle, Tony McBride and Dr Ian Ritchie

month. Under confidentiality, they came to every meeting that I went to, it was great, they wrote up everything I went to, but I think they really got a better understanding of how our sector works and then they went out to other industries within EPSRC's remit, which I thought was sensible. The MRC are professional with their MRCT group and their licensing activity, although they could do with picking their socks up in other areas. BBSRC started the bioscience business competition. I always say when those business plans first came out my mum could have done a better job. In the early years of the competition many of the business plans were of poor quality but through iterations with external advisers within the business competition the quality has improved and now, at GSK, we interact with the companies that are coming out of the competition. It has been successful and other Research Councils are now also sponsoring it. I see that as a positive thing. There is always this tension about Research Councils wanting to badge stuff as their own. Frankly, for people like myself who work across the Research Councils, I take it upon myself to write to the chief executives of the other Research Councils when I think we should share best practice.

Q163 Chairman: Just a brief comment because I do not want to get everybody in to answer every question, a quick word.

Dr Ritchie: Yes, I think the issue is the type of activity you do. I was on PPARC and we tried quite a number of activities. We tried to get British industry to engage with things like CERN and the European Space Agency, and we tried to find some bright students and give them Enterprise Fellowships. We gave them a year of funding and a year of enterprise training. I think that was reasonably successful. I come back to my major point which is a thing like PPARC is very strategic science. Cavendish discovered the electron 100 years ago and it has had a huge effect, but it did not immediately become economically successful. The sort of thing that is going on nowadays, finding gravitational waves or whatever, might solve a problem in 50 years' time. That is what they should be concentrating on, long-term strategic science. Spin-out business is quite serendipitous. The World Wide Web came out of physics research at CERN but there was no connection between physics research and the World Wide Web. The generation of spin-out businesses and economic activity is quite serendipitous and quite often not related to the actual individual science.

Q164 Chairman: A quick word, Tony?

Mr McBride: Just to echo the point that Malcolm made. I think it is difficult to pinpoint one specific action which would have a positive impact across all the Research Councils simply because they operate in different ways out of necessity with different user communities. Good practice will be different for each of them. However, I think that overall the point I would like to make is that closer direct liaison with industry to enhance responsiveness will be the thing we are looking for most. EPSRC has a number of

good examples of how that is achieved, particularly with the close direct liaison of project managers and programme managers with industry, including secondments.

Q165 Dr Iddon: Malcolm, you seem to have expressed some views on how the Research Councils should interact with the Regional Development Agencies.

Dr Skingle: Yes.

Q166 Dr Iddon: Would you like to tell us what those are?

Dr Skingle: Sure. I think the Research Councils have the continuity and the knowledge to know the academic science base. You can pick the telephone up to the Research Councils and if you do not know already you can get to the science base. The RDAs do not have that knowledge. I am encouraging EEDA to get a directory together of all the high tech companies within the region and then to break those down by sector and then I think that they should formally engage with the Research Councils and not necessarily encourage a marriage with a university just because it is 10 miles down the road; it might be the other end of the country but they might be the best at what they do. I feel quite passionate about that because the Research Councils do not have time to hit all of those SMEs. The Research Councils are going to come to large companies like BAE Systems and GlaxoSmithKline, but they cannot possibly be expected in all those different areas to get all those high tech companies. The SMEs are the people who do not have the time to have people like me to work all the various systems to get the leverage of science and technology for the good of their company. I would like to identify two or three companies as exemplars, SMEs, where people have been deposed from large companies, so they know what the big game is all about, and they have accessed the systems. I have a company in my region which has got 10 people working for them but probably three dozen people working their projects because they have got grants from a number of schemes. We should hold those up and other people will want a slice of that cake because they will see there is something in it for them.

Q167 Dr Iddon: A bit of marriage broking?

Dr Skingle: Definitely.

Q168 Dr Iddon: Ian, can you give us your impression as to how it is easy for small and medium enterprises to access funds. Is it better to do that regionally or nationally or does it vary with the SME?

Dr Ritchie: It depends. For a technology business, which is the kind of thing I get involved in, usually they have an international perspective and they have to raise funds, wherever funds might come from. We are quite lucky in the UK that the venture capital community in London is as big as anywhere outside Silicon Valley, so it is fine. That is why God invented EasyJet, so you can go and see these people! Mostly seed capital comes originally from local sources so when a company is just beginning it is the local

29 March 2006 Sir John Chisholm, Dr Malcolm Skingle, Tony McBride and Dr Ian Ritchie

angels or the local start-up funding which helps with that. In that case the regional agency can help with that type of thing. In the case of Scottish Enterprise there is a thing called the Co-Investment fund which funds the early stage gap so it will double the money up to a million of early stage money. Basically, if angels put in half a million they will put in another half a million and that will be a million, and that helps that process go through.

Q169 Dr Iddon: Do you think all entrepreneurs running SMEs know where to go for advice or should Government, through its agencies, be more proactive in supplying that advice to SMEs?

Dr Ritchie: I can only speak for Scotland from my own knowledge in Scotland. In Scotland it is mostly the informal networking agencies like Connect and so forth that do that. Scottish Enterprise I would not have said was the place to call, frankly, for that type of advice. There are things like the Business Forum Club, Enterprise Exchange, Connect, they all have regular meetings. Going along to these meetings, asking who is interested in a particular industry and so forth, where are the angels, that is the way that people network to raise funding.

Q170 Bob Spink: Does anyone feel that accessing funds at a regional level operates an arbitrary constraint in that you are not picking the best to give the funds to? It may be that in one region they have much more demand than another region and, therefore, in one region people will be turned away with projects because there are not funds in that region whereas in another region there are funds going on all sorts of silly schemes because there are not the schemes coming through. In other words, is regionalisation appropriate or is this just part of the Government's regionalisation programme that we have seen?

Dr Skingle: I think, coming from a company which sometimes struggles to recognise national boundaries, let alone regional, carving England up into nine bits does not make a lot of sense to me, I must say.

Q171 Bob Spink: I am glad to hear you say that.

Dr Skingle: The other thing is that for me if it was business you would fuel success, if something is going well then you nurture it. If you have a look at the RDA spending then there is an inverse relationship. North West, Scottish Enterprise and ONE North East would be the ones at the top of that league but obviously they have got more money and there is the regeneration issue which is bound into that. To starve SEEDA, the LDA and EEDA, to have them at the bottom of the pile because they are doing well, does not seem to make too much sense to me.

Chairman: I think we will leave that. We note your manner to Bob's.

Bob Spink: And to you.

Q172 Adam Afriyie: Three very short questions and I will put them to each individual in turn. The first question is to Ian. I enjoyed your submission, by the

way, I know it came slightly late but it was very direct which is very pleasant in such inquiries. Should there be so many support schemes within the Research Councils for knowledge transfers? There are dozens of them, some of them argue they conflict with each other. Should there be so many?

Dr Ritchie: No, I do not think so. I think it is far too complex. My solution is to make this a lot simpler and concentrate on where the problem lies, which is with the commercialisation officers employed by the universities. The Lambert Report was quite clear, it was very cynical about the quality of these people and the valuation of the ownership of IPR and so forth which came out of this process. Two and a half years later we are no further forward, it is getting worse. One of the problems with these various schemes, the old-fashioned way it used to happen was post-docs in a lab had a good idea and they found somebody to give them some money and they started a company, and that was it. If they were clever enough they raised venture capital on the way. Nowadays we have got all these schemes so all these people are now locked to the university, whether with a knowledge transfer scheme or an Enterprise Fellowship or whatever, and they have got to deal with the university because of all these various schemes. The university commercialisation officer asserts ownership of IPR and demands various terms and this all goes backward and forward for months, and it is a real hassle. It has actually stopped several start-ups.

Q173 Adam Afriyie: That is very clear. A question to Sir John. Do all these different funding schemes make any difference to industry? Does it improve things? Does it make things worse? What does it do?

Sir John Chisholm: I do not think I would go all the way with Ian because in the old days when post-docs just used to go and do it, not much happened actually, a lot more has happened since. Just look at the statistics, there is a lot more activity in creating value from science than there used to be, which is a good thing. It is a complicated exercise because we are trying to drive it from the push end and that is a hard thing to do. Because it is a hard thing to do you get all these complicated schemes going. As I tried to say earlier on, certainly in the physics based sciences where our skills are largely focused the difficult thing is the innovation process which gets you from the brilliant invention through to something which generates value or creates interesting knowledge in the economy. How you get attention on that is where the big issue which needs to be addressed is. It is not a simple thing to do.

Q174 Adam Afriyie: Do the various funding issues make any difference to industry? Yes? No?

Sir John Chisholm: They are all trying to get into space. The reason why there are so many and it is so complicated is because no-one has found yet the philosopher's stone here. It is a difficult thing to do. As I said before, part of that is because there is no one answer to the issue. Different issues come in different parts of space. Typically in any venture, in California, for instance, you go through many stages

29 March 2006 Sir John Chisholm, Dr Malcolm Skingle, Tony McBride and Dr Ian Ritchie

of funding with different people coming in at different stages each bringing new expertise. That is because it is a skilful process and it needs different skills as you go along.

Q175 Adam Afriyie: Very briefly, do you think the funding formula is about right now or is it wrong? Which side of that fence do you fall on?

Sir John Chisholm: Certainly I would not say it is right now, it needs to be improved. The focus should be on the innovation process. I think we are pretty good at creating science.

Mr McBride: Can I just make a very brief point to say that members of both of our ICARG Committee and Technology and Innovation Committee have for some time voiced concerns over the nature of the UK's approach to public support for science, R&D and innovation, particularly the fact that it is characterised by this high number of small schemes each distributing a small portion of the pot. That is not to say that there is no positive effect but it is not having the greatest effect.

Q176 Adam Afriyie: My final question, and it is really for Malcolm because I know you are actively involved in this area, what is your view of the Research Council's new performance management system, in particular the metrics for assessing knowledge transfer? I have got something here *The Better Exploitation Output 2*. Are these any good to industry?

Dr Skingle: Metrics have a place. You need to be able to measure something to know whether or not you have improved and moved on. Obviously they should not be the sole driver of behaviours but I think the metrics for increasing knowledge transfer in industry, having spoken with OST and having been involved at the two London meetings—as several people in industry were—I think that they are appropriate. Increase the number of CASE, increase the engagement with SMEs, increase the number of industrial partnership awards, increase modular training for industry, I think they are all sensible targets.

Mr McBride: Can I just add a further point. There are some very good examples and I agree with Malcolm's point that knowledge transfer should not become metrics driven, but certainly there is a purpose to metrics and they can enable improvements in knowledge transfer. There are some very good specific examples but I think the point I would like to make—and this was picked up in the previous session—is on the whole the metrics from the Research Councils are good but they are quantitative. We would urge them to take every opportunity to supplement these types of metrics with qualitative assessments from research users looking at the impact as well. That is difficult, I know, but it has to be placed alongside the sorts of metrics we are talking about.

Chairman: That leads us nicely on to Brian's questions.

Q177 Dr Iddon: A question to Ian first. How aware do you think the Research Councils are of the problems faced by SMEs?

Dr Ritchie: I do not think they are particularly, it is not their job to be, it is not what they are there for. I think this whole process is developed by people who don't understand the problems of SMEs. There are not that many people doing the SME thing and seeing it from the SME's point of view. In all of these areas, including the Enterprise Agencies and the Research Councils and the funding councils, they are all trying to do things but actually very few of them seem to ask the SMEs what it is they want or even measure the results of it and feed it back and so forth. I do not think they are very responsive at all.

Q178 Dr Iddon: Do you think we should get better at that?

Dr Ritchie: I think so. There are a few people like myself who live in both worlds but there are very few of us.

Q179 Dr Iddon: Can any of you give us an example, or more than one example, of how successful the Research Councils have been in engaging industrial stakeholders. What is the best approach you have seen? It is a tough question, I know.

Dr Skingle: I think we get asked to consult on their strategy papers and as a large company we do, perhaps the SMEs cannot. We were engaged, for example, the week before last with a two day meeting at Exeter with the Systems Biology vision for the next decade with EPSRC and BBSRC working together, I think they would certainly attempt to engage us on various consultations.

Sir John Chisholm: I would agree with that but certainly larger companies get ample opportunity to provide individuals to sit on consultative bodies, to sit on boards, to participate in events because large companies have resources to do that. As I was saying before, I do not think we can consider this as a problem that is solved simply by saying we should communicate better. It is a lot more complicated than saying we should simply communicate better. Communication should always be improved but the Research Councils do do a workman-like job at trying to engage with people who want to engage with them.

Q180 Dr Iddon: Tony, have you anything to add to that?

Mr McBride: Only to supplement both those views. I think that there is a good track record across the Research Councils of engagement with large R&D intensive businesses. These organisations are very good at putting their views forward as well so they seem to be candidates with whom to communicate. There are other hard to reach communities and the Research Councils have to do a better job of getting out and meeting those people, particularly in the SME community to fill in those gaps. I do not think the Research Councils can rely on the usual suspects all the time, important though they are, they need to broaden their engagement.

Dr Iddon: That is very clear, thank you.

Q181 Bob Spink: Does anyone think that PPARC's requirement to consider knowledge transfer as part of the standard grant process should be ceded as good practice into the other Research Councils?

Dr Ritchie: I was on PPARC when that was introduced and it seemed like an appropriate thing to do and to ask. My question about that at the time was, is this the right thing to do for the kind of science we are doing? If you have something like gravitational waves, what is the exploitation for that? Maybe we will have weightless machines in 50 years' time or 100 years' time, who knows, but we are not going to have that today. I think it is an appropriate question to ask but I absolutely do not think you should make the scientific decisions on whether there is a realistic answer to that question or not. You should be making the decision dependant solely on the science.

Dr Skingle: I would endorse that view. I think it is good that there is a reminder that people should think about potential outcome, potential exploitation of what they are doing. They should not necessarily be forced, you need that portfolio, that basic and applied research mix for it to be fruitful. Certainly one of my successes personally has come from PPARC in the last 18 months or so where we have taken algorithms that were used to look at the stars and we are now using them in biomedical imaging. It is because PPARC were actively encouraging the technology transfer through their PIPSS scheme.

Q182 Bob Spink: Does anyone think that this requirement could impede blue skies fundamental research in any way?

Sir John Chisholm: Can I express a different view from my colleagues? Ian said earlier on that exploitation came from serendipity which as a matter of fact is true but I do not believe it is necessarily true. Certainly in the field of defence research that is exactly how it used to be done. When it became very much more focused the volume of exploitation increased enormously, so I believe that even in funding research you can be more focused upon the areas in which you are investing. Those areas which are more likely to have a transfer are discernible in advance and a considered research programme built around that as an objective is more likely to be successful than simply serendipity. Having said that, brilliant science inventions have a role and I believe there should always be a component of any research programme which is entirely unlimited and purely blue sky for the purpose of civilisation. I think that is entirely legitimate. I think one should just be very explicit about what one is doing and when one wants to be blue sky, and purely focused on science for its own sake, that is an entirely legitimate thing for a country like the United Kingdom to do but you should be explicit if that is what you are doing.

Q183 Bob Spink: As a potter specialising in raku I understand serendipity.

Mr McBride: Specifically on that question, in preparation I read the comments from Professor Mason to this Committee when he talked about the PIPSS proposals being accompanied by the knowledge transfer plan and I think it is a good idea. It reminds me somewhat of the National Science Foundation in America's criteria which includes a specification for the indication of impact. I agree also that there might be concerns somewhere in the Research Councils about how this would impede blue skies research but I think it is clearly applicable more at the applied end of the spectrum. I do not think it will necessarily over-burden researchers.

Q184 Bob Spink: Could I start with Tony and go along all of you, very quickly, it is a very short answer. Do you think Research Councils should be involved in business training, passing on commercialisation skills, entrepreneurial skills, and if they should be involved do they do it well at the moment?

Mr McBride: I think there is a need for that. Our members have made this clear. I am aware that they are doing some of that sort of training already. To my knowledge they are doing this quite well with the engagement of some companies as well.

Sir John Chisholm: There is a need, as I have said before, for improvement of skills.

Dr Skingle: Yes, and they are doing reasonably well.

Q185 Bob Spink: I thought EDA would say that.

Dr Ritchie: I think it is worth doing. My question would be whether the Research Councils should be doing it or the regional development agencies should do that. In Scotland Scottish Enterprise works with the Royal Society of Edinburgh and they have got Enterprise Fellowships. We have about 15 of those a year. These are bright post-docs who basically get support for a year. They get their salary paid for a year and they get enterprise training for a year.

Bob Spink: I get the feeling there is some sort of question on the inter-relationship between RDAs and the Research Councils, would be an interesting line for us to explore.

Q186 Margaret Moran: On intellectual property rights, as you will have heard in the last session, and we have heard in evidence, industry is sometimes very sceptical of the way in which IPR is valued and used within university. Ian, particularly, you have put forward an interesting quite specific proposal on IPR. Do you think that the Research Councils should be directly involved in proposals of that sort or is that something, as they would say, that they need to create the climate rather than direct the IPR proposal?

Dr Ritchie: I think there is an argument that says the Research Councils should perhaps be more directly involved. The UK used to have the British Technology Group that did this stuff, and then a number of years ago it was transferred and now the commercialisation rights to all research is with the individual universities. The universities vary enormously in quality here. The Lambert Report highlighted this. You have the small universities who

29 March 2006 Sir John Chisholm, Dr Malcolm Skingle, Tony McBride and Dr Ian Ritchie

do not come across much of this stuff and do it very badly. You have got the big universities who do a lot better, Imperial College does a lot and is very good at it. You have a whole range in between. It is very much a postcode lottery basically depending on which university you are with whether you can get a reasonable discussion with a commercialisation officer. In general, and this was highlighted also in the Lambert Report, universities have got an unrealistic recognition of the value of the IPR. In the vast majority of cases, particularly in the world I am in, where you are talking about start-up businesses the things which happen in the lab is a proof of concept, it is an idea, it has to be developed into a pilot, it has to be developed into a prototype, it has to be marketed, and you have to bring commercial and management people in and marketing people before you can start running a business—a process which might take three or four years. When the business is finally running the ideas that are behind that business are only loosely connected with the things which were in the lab and yet we have this problem, and we have it perennially—I am a mentor to enterprise fellows and so forth and I have this every year—the university commercialisation people trying to assert ownership. In one case recently, they wanted 35% of the equity. Until a year and a half ago Edinburgh University had a thing called the non-dilutable 10% which was a concept only known to universities, the real world does not have non-dilutable anything but they had this non-dilutable 10%, we take 10% of your company and after further investment, when it is successful, we still have 10%. Extraordinary! That has gone, thank goodness. We have all this variety of things. Actually just professionalism into that whole process would help, I think. Far be it from me to reinvent the old British Technology Group but at least it was an outfit which knew what they were doing. I think the Lambert Report suggested that there might be regional co-ordination of this type of thing so perhaps a region could have a commercialisation department and that might be a solution to it or it could be RCUK could do it. I think we need a way of getting more professionalism into it.

Sir John Chisholm: There has been a burgeoning of technology transfer people in universities—a vast burgeoning—most of whom, of course, come without a big skill base of their own so they are learning on the job, and of course they are largely funded by HEFCE and the Research Councils. There has been this big burgeoning of people and, as Ian has said, their first action quite often is to get in the way because they are new to it. As Ian has also said, it is a characteristic of all researchers to over-estimate the value of their particular idea. That is true absolutely across the board. A tremendous amount of the value gets created through the later process. Getting that message through to this new growing core of technology development people in universities is often a hard thing to do.

Q187 Margaret Moran: Is there a particular model we have been told about MRC, that could be applied and who would apply it? Could it be RDAs or Research Councils?

Sir John Chisholm: The MRC has a different place because, as I said earlier on, in the life sciences actually there is more value in the original invention. I think from our limited perspective the MRC are better organised than the other Research Councils, possibly because they have a clearer job to do there.

Dr Skingle: I think the Research Councils should not be prescriptive in respect of forcing the issue. They each have very different mechanisms. I think the rule should be that whoever has the ability to protect intellectual property adequately should be the one to do it as long as there is some clear exploitation path. We usually look to own IPRs arising from work that we fund but there is always a reward clause in those agreements which I sign off on to ensure that there is remuneration to the university if the exploitation is successful. We are going to be fair and reasonable because obviously we want to go back to those people and we want the universities to work with us.

Q188 Chairman: Can I thank you all very much indeed. I think we have found it a fascinating journey looking at knowledge transfer and it has become in vogue with the Chancellor mentioning it a number of times in his Budget statement this year. We are anxious to bring in Research Councils which offer us really good practice and with the exception of PPARC, that you all seem to think has got exceptionally good practice, would you recommend anyone else? Is there any other Research Council we should have in?

Dr Ritchie: I do not know quite the scope. Are you looking also at the Funding Councils?

Q189 Chairman: No, we are just looking at the Research Councils.

Dr Ritchie: The Funding Councils have got this knowledge transfer category they are investing in as well.

Q190 Chairman: We might come to that in the future. In terms of the research, is there another good example? We have mentioned the Medical Research Council for obvious reasons, I take your point, John, but PPARC?

Dr Skingle: They each have different things to offer. I do not think by picking on one you will see a true effect. You have already had Keith O'Nions in, he sits across the piece.

Q191 Chairman: What you are saying is apart from PPARC and MRC you have misgivings?

Dr Skingle: I think each of them do good things in different ways.

Chairman: Thank you all very much indeed. We have enjoyed our session with you.

Wednesday 19 April 2006

Members present:

Mr Phil Willis, in the Chair

Adam Afriyie
Dr Evan Harris
Dr Brian Iddon

Margaret Moran
Bob Spink

Witnesses: **Professor John O'Reilly**, Chief Executive, Engineering and Physical Sciences Research Council, **Professor Ian Diamond**, Chief Executive, Economic and Social Research Council and Chair, RCUK Executive Group, **Professor Keith Mason**, Chief Executive, Particle Physics and Astronomy Research Council, and **Professor Philip Esler**, Chief Executive, Arts and Humanities Research Council, gave evidence.

Q192 Chairman: Can I welcome our panel of distinguished experts this morning? Professor Ian Diamond is the Chief Executive of RCUK, and could we ask, Ian, if you could chair your panel this morning as you are the most distinguished of the distinguished in terms of your seniority as Chief Executive of RCUK?

Professor Diamond: Can I just clarify something? I am Chief Executive of ESRC and Chair of the Executive Group of RCUK, which does not raise me in any whatsoever above my colleagues to my right and my left. It is simply that they have asked me to chair what is an entertaining meeting once a month and to lead for them on a number of items.

Q193 Chairman: Thank you very much for clarifying the lowly status of RCUK. We welcome too Professor Philip Esler, the Chief Executive of the Arts and Humanities Research Council, Professor Keith Mason, the Chief Executive of PPARC, the Particle Physics and Astronomy Research Council, and Professor John O'Reilly, Chief Executive of the Engineering and Physical Sciences Research Council. I am making these points quite deliberately because we are being broadcast live this morning on radio, so could I ask you to be particularly circumspect in terms of any irate language you might use during this session. It is a little bit like the Big Brother house here. This is an important session in that what we have tried to do with this inquiry was to look at the issue of knowledge transfer, which is an incredibly important issue, and to look at the way in which research councils are dealing with knowledge transfer. We have had a series of witnesses in and this was the first of attempt of the committee to look at the thematic approach of the work of the research councils so we are particularly grateful to you for joining us this morning. Professor Diamond, can I call you Ian?

Professor Diamond: Please call me Ian, yes.

Q194 Chairman: If I may start with you, you have had the External Challenge group whom you commissioned to produce a report in December for you. What do you think of the report?

Professor Diamond: It is an interesting report. We received it not long ago. It makes a number of very interesting suggestions of activities for RCUK as a whole and for each of the individual councils. We are

currently within each council in the process of digesting the recommendations and we will respond in due course.

Q195 Chairman: Do you agree with most of them?

Professor Diamond: I would not say that we agreed with most of them and it is certainly beyond my own personal brief to be able to answer for the other councils as they have the opportunity to review and digest their own. Certainly we will be discussing the report at the next meeting of the Executive Group in a couple of weeks, but as for the ESRC ones I think there were some interesting questions which we would certainly wish to take on board.

Q196 Chairman: You clearly have had great disputes, have you not, with the External Challenge Panel? You got them as an independent panel and when they produced the report in draft you had it altered. You refuse to publish it now until you can respond to it in detail. Is that not a bit strange?

Professor Diamond: I think that is something of a misunderstanding if I may say so. When the initial report came to us it did include a number of factual inaccuracies. When I say "factual inaccuracies", I mean factual inaccuracies of what we did, not with regard to the recommendations. At that time the Executive Group asked me to meet with John Murphy, whom I understand you have met in this committee, and with Alan Driver, who is the scribe for the consultants brought in to write the report, to discuss these factual inaccuracies. At that meeting—and I had one formal meeting with them and a number of phone conversations with John Murphy—what I did was make it extremely clear that RCUK was not in any way interested in discussing the recommendations until they had been received but that we all felt that it was much better and would make the report much less forceful if any of the factual inaccuracies, which had sadly come into early drafts, were to remain.

Q197 Chairman: Why did you not simply publish it? Why do you have to wait until you have a response to it in order to put it into the public domain?

Professor Diamond: We have only just received it. It was received a week ago last Friday. That was a couple of days before Easter and what we said we would do was get it straight over to you and then we will publish it in the next little while. We do not have

19 April 2006 Professor John O'Reilly, Professor Ian Diamond, Professor Keith Mason and Professor Philip Esler

a problem with any of it. It was simply a question of an iteration of drafting while we waited until the statements of fact were agreed and John Murphy seemed extremely happy with that. I have had some very helpful and positive discussions with him and I do not think he or I would say that there was any dispute.

Q198 Chairman: So you still feel this is an independent report?

Professor Diamond: Absolutely right. It is an independent report.

Q199 Chairman: So it will be published this week?

Professor Diamond: It will be published in the near future.

Q200 Chairman: Okay. Why was the panel criticised for not evaluating specific research councils' knowledge transfer schemes? Surely that is your job, not theirs?

Professor Diamond: The panel looked at the individual research councils and the panel responded to the evidence that was given and then further evidence was given in response to the panel. That seems to me an entirely appropriate process to go through.

Q201 Chairman: The business of Science in Society, to rule that out and say that that is nothing to do with this particular piece of work: we found that strange.

Professor Diamond: That is an interesting question and that is an area for discussion. It depends on your definition of knowledge transfer. When the panel's terms of reference were agreed between research councils and the now Office of Science and Innovation, Science in Society was not included in the terms of reference. Had it been included in the terms of reference then, of course, much more evidence would have been given by the research councils on the activities in that area. The question you would then wish to raise would be whether or not Science in Society was actually part of what we defined as knowledge transfer. We would say that, while there is clearly a grey area where they meet in the middle, the definition of knowledge transfer would not include the way we look at Science in Society although there has to be a continuum moving across.

Q202 Chairman: Has anybody any other comments about the report? Have you all seen it now, gentlemen?

Professor Mason: Just to add one brief comment, this was commissioned by the research councils so that we could learn from it and go forward, and I think any issues there have been with the report are because we want it to be useful for us and we want it to be evidence based and we want that evidence to be something we can build on. I do not think there was anything untoward about the process at all. I think it was a difficult exercise. The panel did a very

difficult job; they did it very well, but clearly in the short time available it was not perfect and we tried to work with them to make it as useful as possible.

Q203 Dr Iddon: Do you think anything useful has come out of it? Are you going to take any notice of the recommendations? Are there any major ones which are going to change the way you work, Ian?

Professor Diamond: Again, speaking for ESRC, it makes some helpful suggestions around the concordats with industry, which I think is a way forward that we will be considering very seriously given the huge success of our concordats with government departments. It also makes some suggestions around the way in which we might continue to develop our interface, if you like, where more and more social scientists are spending time in government, in industry and vice versa. Those are really helpful suggestions which we will be considering how best to take forward. Yes, I think it does make sense and I do think that for ESRC the suggestions are incredibly helpful. Some of the RCUK suggestions, if I may say so, do not quite understand the nature of RCUK; others are very helpful and yes, we will be considering them very seriously and I think they will make some differences.

Q204 Dr Iddon: In view of the difficulties that have become obvious as the process has gone along, do you think you will be repeating this process?

Professor Diamond: I think we will be talking about the way in which the process went forward. I think that to say there were difficulties is rather overstating things. Basically the report came,—

Q205 Dr Iddon: It is a word you have just used.

Professor Diamond: It has been through a couple of iterations, but iterations around the factual accuracy, not around the recommendations. We now have a document which is factually accurate about what the research councils do and makes some suggestions which we are digesting and which we will respond to.

Q206 Dr Iddon: There is a current review taking place of research council economic impact. Is there going to be a lot of overlap between the two reports when the second one is ultimately published?

Professor Diamond: I am going to pass that over to John O'Reilly if I may because John sits on that committee and would perhaps be best to respond to that.

Professor O'Reilly: There is an Economic Impact Group. It involves people from the research councils. Julia Goodfellow and myself sit as representatives in that sense. She is Chief Executive of BBSRC. It is chaired by a senior industrialist who is also chair of one of the research councils. It has industrial participants and so on. It includes, incidentally, John Murphy, who is a member of that group, so in a sense that is a bringing together where we can look at the economic impact that is being achieved, gaining an understanding of that, a shared understanding, I would say; I think we do have a

19 April 2006 Professor John O'Reilly, Professor Ian Diamond, Professor Keith Mason and Professor Philip Esler

good level of understanding within the research councils. I view that rather as a learning and understanding exercise as distinct from the External Challenge where, if I might add to what colleagues have said, one of the most valuable things of the External Challenge was not just that it was independent but that we sent them information and then they played it back to us, and the fact that the report that came back contained factual errors, inconsistencies and so on tells us something about communication, about how hard it is to communicate the diversity and richness in this area. I think that is a strength in the sense that, perverse though it may seem to you, the fact that we had that dialogue was underscoring the diversity, the strength and so on that is there. That makes it all the more appropriate that we now have the Economic Impact Group that brings these different facets together, allows these different perspectives to come into play, and shares them.

Q207 Dr Iddon: But the question was, is there going to be duplication?

Professor O'Reilly: I do not view it as duplication. There is overlap, usefully so. It would be inappropriate, if there was an Economic Impact Group working now, given that we have just received that report, if some aspect of that did not feature in it in just the same way that, when you and your committee eventually publish your report from this hearing, that will feature in the considerations of the research councils. We learn from all the interactions and we will learn from this interaction in the same way that we have learned from these other two.

Professor Diamond: And economic impact is but one facet of the wide and rich cornucopia of activities which is knowledge transfer. That particular report is just focusing on the economic impact and, as John says, absolutely rightly, there will be some overlap but it will not be total.

Q208 Dr Iddon: Can I be a bit of a devil and ask the question, do you think the Government is putting too much pressure on the research councils to have an economic impact and taking you away from blue skies more and more?

Professor Diamond: Again, if I might speak for my own council, absolutely not. I do not feel that pressure at all. I personally believe it is an absolute necessity that anyone who wishes to take public money to do research should, where appropriate, use the results of that research to have an impact on the economic development and quality of life of the people of the United Kingdom who funded it, and indeed further afield. I think that is entirely appropriate and I think the research councils' role is to act as a conduit where appropriate to identify that and enable it to happen because it will not necessarily happen everywhere. I do not feel any pressure from the Government to do that.

Q209 Dr Iddon: Is that a general view within the councils?

Professor Mason: I would pick up on that and say that I see it as a positive thing because a two-way flow of knowledge between the research communities and the wider scene is good for everybody. It creates an environment where innovation and new ideas can flourish and that is to the benefit of everybody.

Q210 Margaret Moran: I am interested in this non-tiff with the External Challenge Panel report. You referred to problems being in relation to matters of fact, but one of their conclusions was that the research councils' lack of strategic vision and approach to knowledge transfer was pretty fundamental. They said that they "had concerns about the apparent lack of long term vision... at the highest strategic level" and "there was little evidence of a coherent and structured approach to knowledge transfer or knowledge creation...". That is not a matter of fact. That lies at the heart of what we are discussing here. What is your long term vision?

Professor Esler: As far as the Arts and Humanities Research Council is concerned, we have only been in existence for a year so knowledge transfer activity has really only begun significantly since we came into existence on 1 April 2005. We have recently begun to redo our strategic vision and a central aspect of that vision is knowledge transfer. At the council meeting we had in March we spent an hour and a half brainstorming the vision and central to it was knowledge transfer. I think everyone there was absolutely delighted at the real passion that members around the table expressed for knowledge transfer, especially the view expressed by one of them that was widely adopted, that we are really situated in relation to the creative industries in what is a kind of new industrial revolution where content is being integrated with digital media in many different sectors. We are, if you like, the custodians and the impresarios of the content in the UK and there was tremendous enthusiasm for that. As far as our council is concerned, we are very excited about knowledge transfer. That, of course, happened after the report had been compiled but, commenting on it, it is not an accurate reflection of where we are as a council.

Professor Diamond: We have already said that we will be reflecting on it and responding and I think as the ESRC we would not agree with that statement, but indeed the section on the ESRC certainly does not make that view. There is a long term vision and I have given it to you already.

Q211 Margaret Moran: Could you articulate it very specifically for us?

Professor Diamond: I have already given it to you, if I may say so, and that is that research from ESRC, where appropriate, should impact on the economic development and quality of life of the people who funded it. In addition there should be activities to ensure that there is an interface of people moving in and out of policy and of industry so as to be able to

19 April 2006 Professor John O'Reilly, Professor Ian Diamond, Professor Keith Mason and Professor Philip Esler

maximise the evidence base on which industrial and government policy at both local and central level is made in this country.

Q212 Margaret Moran: And that applies across all of the research councils?

Professor Diamond: That is the ESRC mission and I am going to ask Keith and John for their views as well.

Professor Mason: As we said earlier, the whole point of the report was to learn from it and if the report concludes that there is no long term strategy we have to take note of that, and I think that is again a communication issue because I think that in each research council there is a very good strategy. Certainly within PPARC our whole programme is based on the fact that we have to take a long term strategic view because we are engaged on programmes that extend over many years and the knowledge transfer aspect of those programmes is fully integral to that long term strategy. We actually operate in a forum where we have both to commission the knowledge that we use in our programme and then to propagate it back to the industries that are supporting the programme. That whole thing cannot exist without long term planning so it is integral to what we do from the very beginning.

Professor O'Reilly: First of all, you will find differences between the research councils; you should not be surprised. We are very different entities. Some are directly involved in knowledge creation themselves and others are exclusively involved in funding those who create the knowledge. So you will find, rightly, that a council that has its own institutes will engage in certain aspects of knowledge transfer differently from councils that do not. In the case of EPSRC, we are a pure funding research council. All the knowledge creation takes place in the universities and our role is to support, foster and enable that. That said, we have a vision for knowledge transfer which we say is the EPSRC vision but in a real sense it is a vision for the UK and it is for the UK to be as renowned for knowledge transfer as it already is for knowledge creation. We have a long established pattern in the UK of absolute excellence around the world, and acknowledged, and I underscore the word "renowned". It is recognising the excellence. There is excellent practice of knowledge transfer in our universities; that can be made yet more effective by bringing it out—and sharing that best practice is where we are from our perspective.

Q213 Dr Harris: Can I ask on Margaret's question, do you think that these business people that you appointed, the External Challenge Panel, were disappointed that each research council had not paid a vast amount to consultants to advise it on its mission statement that it should put on the letterhead, because that is what business sometimes does which is less interested in the specifics? Do you think that is a possible explanation of why there is

this disjunction between their report on this area and what you feel you are actually doing and saying you are doing?

Professor Diamond: You would have to ask them that.

Q214 Dr Harris: But you would recognise that there is a difference in cultures, that everyone in business is into mission statements, whether airy-fairy or otherwise, whereas people in the world of science are actually into getting on with it and not navel-gazing and coming up with arguments about which adjective or verb to put in a mission statement?

Professor Diamond: I think you would find that the great majority of research councils—and I say "the great majority" only because I admit that I could not speak to every research council but those that I know—have statements about knowledge transfer in their mission. I simply do not know also of a research council that has spent any money on developing that mission statement.

Q215 Dr Harris: The point about your mission statement, which you have said twice, is that the opposite of what you have said is pointless, is ridiculous, so it is hardly worth saying that your research council should, where appropriate, make sure that economic gain is maximised because that would imply that if you did not do that you would want them, where appropriate, not to maximise economic gain.

Professor Diamond: No. I am terribly sorry, but the use of the word "appropriate" is because there are parts of the research base which it would simply be silly for people to rush around trying to maximise the economic impact of because it is developing and underpinning theory, for example.

Q216 Dr Harris: I was not arguing with those words: I think you are right to include them, but what does that add, that mission statement? It is a statement of the obvious, is it not, because not to do it when it is appropriate would be ridiculous?

Professor Diamond: But surely one should be making an effort to make sure that that is happening and have an underpinning set of strategic activities and objectives which do make that happen, and both the report of the ESRC for the last few years, and indeed the External Challenge report, say that this is being done pretty effectively.

Q217 Margaret Moran: I want to look to something which Professor O'Reilly mentioned, which was the university funding. Obviously, I am sure you are all very pleased at the ongoing commitment that the Chancellor announced in the Budget to funding for knowledge transfer, but you appear to be suggesting that more effective use could also be made of or greater value could be gained from the existing money spent on research in universities and that that was not happening currently.

Professor O'Reilly: That was not what I meant to say, so let me clarify. I think very good use is being made of the funds that are made available to universities. I think in the UK the universities are

very impressive organisations. What we want to do is maximise the value that comes from that work. There is a process that goes from knowledge creation right the way through to economic impact, and there is a part that is very strongly in the domain of the research councils through the universities and then through into business. If again I were to take it to EPSRC; what do I think is the most important thing for EPSRC and where we are channelling our efforts to improve the effectiveness? It is to do what we can to stimulate and increase the appetite of business for engaging in research and associated training and in knowledge transfer. It is that coupling and playing a part in maximising that. And many of the innovations that we have put in place over the last two or three years are very much focused on that. I believe it is the case now that over 40% of EPSRC grants involve collaboration with business directly: substantial in-cash and in-kind contributions. That has been brought about in large measure by us talking with the universities and them responding. We talk with business as well, but I am very clear in my own mind that simply shouting more loudly at the universities is not going to increase that further. What is going to be much more effective is if we can communicate much effectively to business the importance of that and do what we can to increase their appetite. In the case of EPSRC that is achieved largely by empowering the universities and fostering it.

Professor Diamond: I think the EPSRC does this extremely well and there is also an imperative, certainly for ESRC, that what we do is make this a country where it is much easier than it is at present for people to move in and out of academia and business, or indeed government. The people transfer is something that is not always seen as being as important as it actually is in this area and I think that is a real challenge for the next few years, to really increase the opportunities and activities in that area.

Q218 Margaret Moran: I take it from that that you are content with the value that is being offered by the universities. Could you say the same thing about the research councils? How would you measure whether the work the research councils are doing on knowledge transfer is actually adding value? What is your measurement?

Professor O'Reilly: We have recently agreed a set of metrics, stimulated, I have to say, by the ten-year framework. The ten-year framework for investment in science and innovation is a really positive thing that has been done and it stimulated us. When that was articulated down—you take the vision that is in there—there are two key outputs that have been identified, which are what the science vote is about really; that is what it says. The first is a healthy science and engineering base. Because if we do not have that—and to some extent this is a response to Dr Harris, which is that we have to make sure that it is healthy and productive,—whatever else we do is lost. And the second—and these are equal—is better exploitation. What we have done as a family of research councils now is to agree a set of performance metrics that you could put on to those

two outputs and say, “Can we have leading indicators on them?” and so on. So those are available, and if they have not been sent to you we would be very happy to send them to do so.

Q219 Chairman: We are going to raise the issue of the metrics later on because it is a very important issue and we were somewhat, I would not say confused, but we need a greater understanding of how they have come about and indeed what is involved in them and how much agreement there is across the research councils.

Professor Esler: We have a very distinctive approach to this. We see the benefit of some metrics but we do not think metrics alone can measure the impacts that we have. One of our issues with the External Challenge definition was that it was good as far as it went but it did not quite go far enough. It did not, for example, cover knowledge transfer which is simply the production of social capital. For example, when people go to a significant exhibition, such as the Michelangelo exhibition which is on at the British Museum at present, things happen to them. Those things are difficult to demonstrate but they can be demonstrated. Lives can be changed, for example, careers can be amended and so forth. We are working on ways to measure that kind of impact, which may not necessarily be quantitative, so it is a rather different challenge as far as we are concerned. We have, as you will have seen in the information we provided, four impact fellowships that we are at present funding to explore this rather new area.

Professor Diamond: It is also worth saying, although we will return, as you say, Phil, to the metrics a little later, that metrics are not always quantitative and within the cells of the matrix which John O'Reilly has described already, there are a number of metrics for different research councils which are both quantitative and qualitative, and I think it is terribly important going forward that we do that.

Q220 Margaret Moran: But there is no single measure across the research councils?

Professor Mason: There is no single measure and you would not expect there to be because we are dealing with a number of timescales, for one thing. One thing that is very apparent and very measurable is that, for example, we at PPARC put a lot of effort into talking to industry and seeing how we can bring industry and academia together. One of the things that encourages us that we are doing the right thing is that industry keep coming back and my experience is that if they are not getting anything out of it then they would not come back. The response of the audience, if you like, is probably one of the best short term metrics as to whether you are doing the right thing or not.

Professor Diamond: Margaret, if I may say so, you have highlighted an area that is terribly important. We have, through having the research councils that we have in this country, the opportunity to really maximise the breadth of our activity in a beautiful way and knowledge transfer is one of the areas where we simply would not expect one size to fit all, and you have heard already the descriptions that Philip,

19 April 2006 Professor John O'Reilly, Professor Ian Diamond, Professor Keith Mason and Professor Philip Esler

Keith and John have made of the heterogeneity that exists and I think it is terribly important that we recognise that there is not one size that fits all on knowledge transfer.

Professor O'Reilly: To underscore that briefly, Chairman, just to illustrate the complexity, very recently with QinetiQ EPSRC has co-funded a chair specifically in this area. And the objective of this chair is to gain a greater theoretical and practical understanding of the knowledge transfer processes specific to the physical science side of things. The view of QinetiQ—and you will know of QinetiQ and what it is; it is an IP company in a very real sense—is that they themselves are saying: “We need to understand this better”. The complexities are not well understood. As a research council, in discussion with John Chisholm, he and I put this together. We said, “we will invest in understanding this because EPSRC, QinetiQ and the UK will derive benefit from that”. So there is a chair in Imperial College focused specifically on this, picking up that diversity and challenge.

Q221 Margaret Moran: I have one more question specific to you, Ian, on the relationships between the research councils and the RDAs. Do you think there is tension there? How can relations be improved to help them work more effectively to deliver knowledge transfer between yourselves?

Professor Diamond: That is a really good question. “Tension” is not a word I would use at all. Having said that, there is a rich diversity amongst the RDAs and we are certainly at different scales of relationship with different RDAs and I think it is a high priority for the next few years. Indeed, when I met with Keith O’Nions just 10 days ago on behalf of RCUK that was an area we highlighted, that we really have to identify improved ways of working with the RDAs in this area, and again that is not to speak of the RDAs as one group because there is great heterogeneity and with some RDAs there is really good activity that some of my colleagues will talk about.

Q222 Chairman: We have a real concern about this particular area of RDAs, some of whom have built a body of expertise which is interfacing with the universities and which is doing an absolutely splendid job. They have made a real effort to get people in place who understand the issue of knowledge transfer and bringing it forward. Others do not seem to be anywhere near the starting gate on that. There is, if I might say so, coming out of the External Challenge report something of a disconnect in many ways with some of the work the research councils are doing in terms of knowledge transfer as well. If the RDAs are struggling with it, and, with respect, some of the research councils are struggling with it, this is one of the reasons we have had this inquiry: to say where do we move forward with this issue because it is so incredibly important as far as the nation is concerned?

Professor Esler: If I give two good examples of where I think progress is being made, we are introducing knowledge transfer fellowships this year

which will provide opportunities for scholars to have a period of leave to develop a knowledge transfer project. We have an agreement now with SEEDA to have their help in the processing of applications. They were very happy with that as they co-ordinate knowledge transfer in this area in England and that is very encouraging. Secondly, we are very interested in computer games as one of the creative industries within our ambit. In Scotland, Scottish Enterprise Tayside leads in computer games because it is based in Dundee and that is where they are very interested in a computer games cluster developing around the universities. We have been there on a visit which they sponsored. We are in discussion with them. There are some very encouraging things happening, so there is a good side to this.

Professor Diamond: And we are jointly funding a post in SEEDA to take this forward, so there are some really good areas of good practice, but I personally would be the first to agree that we need to develop this and push it out across the whole RDA base and that is a high priority for the future.

Q223 Dr Iddon: I want to carry on a question I started earlier, and that is on the relationship between pure and applied research. In the past, and I know this is a simplistic argument, the research councils have been superb at funding pure research, including blue skies research, and industry on the whole have been very good at funding the applied research. Now it seems you are going to have to be master of both. My first question is, do you think you have got the funding plans right across the research councils in funding pure research and applied research or is there a tension there?

Professor Diamond: I am going to pass it initially over to John O'Reilly because he has already highlighted the way in which EPSRC's funding is absolutely a mix of those two areas. I should say very clearly that we do not see a distinction across all the research councils between basic and applied, which is all, if you like, frontier research and all absolutely excellent, world-class research.

Professor O'Reilly: I was going to use precisely the words that Ian has just used. There was a report produced for the European Commission recently from a group chaired by Bill Harris, Director-General of Science Foundation Ireland, where he said that the old divisions that we used to have between pure and applied research are really no longer applicable today. He introduced—or at least he was the first person that I heard introduce—the term “frontier research” and said, “that is what research councils are about”. We are about frontier research. But we would do ourselves down, do our communities down and do the country down if we said that that equated therefore only to what in old terms we used to call “pure”. It is a spectrum. We are absolutely about funding at the frontier and I do not divide this between whether we should be involved in pure research or something that is the business of business. The fact that over 40% of EPSRC grants have direct business involvement says that business recognises the value of engaging at that early stage in these frontier activities and being part of a channel

19 April 2006 Professor John O'Reilly, Professor Ian Diamond, Professor Keith Mason and Professor Philip Esler

for it to flow through and get taken up. So I could not tell you what the figure is because in a sense I just question the attribution. If you say, "What fraction of EPSRC funding is pure research?", I would say it would depend what you meant by it.

Q224 Dr Iddon: Would you agree that in the past the Research Assessment Exercise has been a barrier? Perhaps academics have been more inclined to publish pure research to get the points out of the Research Assessment Exercise for the universities and have kept away from applied research?

Professor O'Reilly: No, I do not think that is true. Again, I do not think it is a pure or an applied research thing. I think the RAE has done some useful things but with all of these things you have to be careful of the unintended consequences as well. What you are alluding to, I think, is the possible unintended consequence and, of course, the Chancellor recently made a statement about the future of the RAE picking up on that point.

Q225 Dr Iddon: Suggestions have come from some quarters that we should separate the funding of pure research from the funding of applied research using public money. Any offers on that?

Professor Mason: Can I jump in with an example, because I think it is important, of what we do in the PPARC area, where I think much of what you might call knowledge transfer in our area is actually knowledge stimulation. In other words, we have very demanding scientific requirements for what you might call pure research and studying the ends of the universe—you cannot get more pure than that in some people's minds. Those very strict, very demanding requirements drive technology developments. We need new sensors, we need new equipment in order to push back the frontiers, and so in a sense we are commissioning these things from both the university base and the industry base, high technology, high added value systems, which can then be fed back into wider applications. Once you start to see the programme in that way then it is clear that there is no distinction between pure and applied. You need one to do the other and vice versa, so they really feed off each other. There is a synergy and the programme is healthier as a result of that.

Q226 Chairman: We are struggling now. Can I come in here because I really am struggling? We have been told over and over in this inquiry that the issue of third stream funding, which is really pulling the knowledge transfer out of university departments and, if you like, into business, is one of the issues which is becoming an either/or in funding terms. The point we have been given by the universities is that more and more they are being asked to emphasise the work of knowledge transfer, and indeed, in terms of your own grant scheme, we have been told by research fellows that they have to try and indicate what are going to be the applied research possibilities of the project before you will give them the money, so all that is stacking up in one direction.

Professor Mason: Can I clarify that because this is not exactly as you describe it? We do now, and this is something that we have introduced very recently, require people applying for grants to have a knowledge transfer plan. There are two aims for that. It does not mean that poor science is going to get funded. The science has to be excellent and you are not going to get anything funded on the back of a good knowledge transfer plan unless the science is great; that is the first point to make. The reason that we ask for these plans is to embed the thinking about knowledge transfer right from the beginning so you do not have it as an add-on at the end where the investigator might want to move on to some new area. Basically what we are talking about here is embedding the requirements and the desire for knowledge transfer right at the beginning so people are thinking about it alongside thinking about how they are going to take their main research programme forward. That is one aim of doing that. The other aim is to maximise the economic benefit by alerting us to the potential for knowledge transfer in a particular programme so we can focus the resources we have on the programmes that are likely to deliver the most economic benefit, so this is an efficiency argument.

Q227 Chairman: It is a slow business.

Professor Mason: The main thrust is still to do the basic research that we commission.

Q228 Dr Harris: But what you have just said, if I may just interrupt, because I wanted to make the same point, undermines what you said at the beginning because you said, "Regardless of this we are going to fund the best science"; right?

Professor Mason: Absolutely.

Q229 Dr Harris: And so, for the purpose of the compulsory knowledge transfer consideration, forcing these scientists to go through this process even when it is very blue skies or it is at a very early stage is to encourage the culture and to help you decide how to maximise from your funding the knowledge transfer—that was the second thing you said—to maximise the use of your funds for knowledge transfer. That does imply that with two equally good applications one is going to get funded if it has more obvious knowledge transfer implications.

Professor Mason: No, no.

Q230 Dr Harris: That was the implication of what you said and that is the view out there.

Professor Mason: That is not what I said, but I think what I am saying is—

Q231 Dr Harris: I said it was the implication of what you said, and I can tell you from talking to my constituents that that is the feeling that they have with this new strategy that you are doing, so this gives you an opportunity to, I hope, acknowledge that that is a fear and put it to rest.

19 April 2006 Professor John O'Reilly, Professor Ian Diamond, Professor Keith Mason and Professor Philip Esler

Professor Mason: I recognise that it is a fear but it is not the reality. If there is no knowledge transfer aspect of a proposal then the investigator can write down, "There is no knowledge transfer aspect of this proposal" and we will make a judgment accordingly and if we agree then there is no issue. The point of this is not as a scoring system for picking the best science. It is to maximise the benefit of the things that we fund and so, where there is a large knowledge transfer potential, to alert the investigator that they ought to be thinking about it and also us that we ought perhaps to be helping them to realise the potential of that knowledge transfer through our brokering schemes and the other means we have for ensuring that that comes out.

Q232 Dr Harris: But could you not make the same point, that sometimes people are too interested in knowledge transfer and are undermining the equality of their science by focusing too much on that? You could argue that there should be a basic science paragraph in the grant application to ensure that grant is not straying appropriately and you are back to square one if that is the case.

Professor Mason: There is. In a typical grant there might be 20 pages on the science and one page on knowledge transfer; that is the balance. The science question has primacy and it quite clearly says in the guidelines that the science questions have primacy. The question is how do you put in added value to those investigations in order to realise the knowledge transfer aspects as well? The whole point, as we have tried to say here, and certainly I would emphasise, is to generate a culture in which new ideas can flourish, and that includes what you might call the knowledge transfer aspects as well as the pure science. As I answered in response to Margaret's question, in our field the two go hand-in-hand. You need the new technology developed in order to do the science and the science drives the technology developments so they go hand-in-hand in many cases.

Dr Iddon: In the past in the universities we have had dreamers, like Harry Kroto. They never publish very much and they pursue perhaps what we would regard as a mad idea but in the end they gain a Nobel Prize.

Dr Harris: And they did not have a mission statement.

Dr Iddon: Is there room for people like that in the universities today?

Chairman: Will you just ignore the comments that are made?

Q233 Dr Harris: But it is true: they did not have a mission statement.

Professor Diamond: I know this sounds a trite statement but universities are autonomous institutions and they have to make a judgment about what is going on across the portfolio of their research community. If they believe that there are people there who are really adding value but are not, if you like, writing the four recognised publications that an RAE requires, then it is entirely right and proper that they should keep those people there, and

indeed for some panels it often does take longer for the thinking to go on and then people reduce the number of outputs that have been allowed within the RAE. Is there room in the universities for those people? I think personally that there is room in the universities for people such as that, but most universities would be looking for a balanced portfolio of staff in their department.

Q234 Chairman: You can see the tension we are having as a committee in this area between the pure research, however it is described, John, and this desire for knowledge transfer.

Professor Diamond: I will pass that to Philip.

Professor Esler: Chairman, I do want to address this issue from our perspective which does have its own interest. I have actually provided to the Clerk a handout which I think is—

Q235 Chairman: We were singing it yesterday evening.

Professor Esler: It is a phenomenon that I discovered when I visited Oxford University last year. This is just one example of the riches that are available in the UK's cultural tradition and in its collections. This particular case is from the Bodleian Library's collection of some 30,000 Broadside Ballads. They include single sheets of music, sometimes with the actual music, sometimes just the lyrics, which have been published in England and in other parts of the UK since the 17th century. This is a very interesting one. It is *Lilliburlero*, which came out in 1688 and which some of you, of course, will have been hearing recently before BBC news broadcasts. The point that I want to raise here is the difficulty of distinguishing between pure research and applied research and knowledge transfer in our area. At one level this text is a fine subject for a modern historian. He or she will look at the role this document played in the events of 1688 and it seems, as it is an anti-Irish song, to have played a significant political role at the time of William and Mary and the wars in Ireland, and so it could appear in a journal of ethno-musicology or there could be a learned monograph. It should be very important, solid research done by scholars, but when you look at it you think, "Goodness. Surely it has to be brought into a new context where it can make an impact". It could be that the whole corpus should be subjected to commercialisation, that there should be productions of the music, perhaps using traditional instruments, perhaps not, that could be brought into conjunction with popular music, or there could just be impacts in the relation between popular music and politics such as we see with, say, Bob Geldof and Band Aid. It cries out to be brought into a new context where it can make an impact. So, although in our current documentation we do not require people making applications for grants to specify knowledge transfer, we do hope to encourage them to take the lead from their pure research to knowledge transfer, especially as asking contemporary questions might give them interesting new research agendas in relation to the 17th and 18th centuries. So for all of those reasons we are keen not to mandate but to encourage knowledge

transfer, and we do find it a little hard to see the distinction sometimes between pure research and knowledge transfer.

Q236 Chairman: Can I just say that I think the universities are struggling with that concept.

Professor Diamond: Perhaps you have identified a communication issue that perhaps it would be very useful to discuss. We meet regularly as chief executives with, for example, Drummond Bone, President of UUK, many of us spend a lot of time visiting universities, and it is something that perhaps we ought to proactively raise with the universities.

Q237 Chairman: So what you are saying, and I think what Philip is saying and indeed what Keith is saying, is that in terms of the researcher and the research programme they ought to be having embedded into their psyche the idea of knowledge transfer as part and parcel of what they are doing? Is that the point you are making?

Professor Esler: Yes, that is what we are saying and it is true that the RAE has not encouraged that sort of activity.

Q238 Chairman: That is right, and you get no money for it.

Professor Esler: Let us face it: we for our part are establishing an ensemble of mechanisms to encourage the activity, especially by promoting exemplars, prototypes, people who have done it who can be publicly visible, who can fertilise the imagination of their colleagues with the possibilities in this area, the sorts of things which do not exist very much right now.

Q239 Chairman: But this is one of the points I made about the third stream funding. The universities say, "We do not get any money through the RAE on this and we do not get separate funding as the third stream funding for knowledge transfer", and you do not give it as part and parcel of your grant from the research council itself, where do universities get this money from? What you are suggesting is another way forward in terms of actually embedding this into the whole scientific cycle?

Professor Esler: Yes, that is our approach. We are not looking at a huge proportion of our funding here. If you look at the projections, our knowledge transfer budget in two years' time is about 8% or 8.5% of what we would be spending on research, but it is a stimulus and it is based very specifically on the fact that it is so hard to draw the distinction and we want to encourage colleagues to think about the knowledge transfer applications when they are doing their research, especially as that will give them new and interesting research questions to ask.

Q240 Dr Harris: All these pots of money from the DTI are for knowledge transfer, okay, and there is not any basic science-without-knowledge-transfer application that will succeed in getting that money. It is biased in favour of knowledge transfer. It is exclusive to that. Is it not appropriate therefore that the research council stream, which is to do the best

science, not pure, not applied, but the best, should not be subject to the temptation for you to sing this song as well because there is earmarked funding for that and as soon as you start going down this path people think that we are no longer funding the best science?

Professor Diamond: I think we have all made it very clear that the best science is the criterion for funding from the research councils and that that will remain so. What we would say is that the best science can sometimes be informed at the earliest stage by interaction with potential stakeholders, and again it is also appropriate that we work to identify those areas of our portfolio where there is the opportunity to maximise knowledge transfer, and I think John wants to add something.

Professor O'Reilly: Two things if I might. First of all, when I was speaking previously we were talking about pure research and applied research and then you mentioned the distinction between pure research and knowledge transfer. I do not like the pure research/applied research division, but I like even less the equating of applied research, whatever it means, to knowledge transfer. Knowledge transfer is actually about the process. So there is room for confusion there; just to clarify that. But then specifically on this point I merely wanted to say—and it is an approach thing—that for over 10 years now on an EPSRC application form for a research grant, that is a grant to engage in frontier research, a question that has been asked is, "Please identify the beneficiaries of this research". What that is doing is embedding it and orientating people. In some cases they will say, "The beneficiaries of this piece of mathematics are other mathematicians for the more complete view we will have of mathematics in something obscure like Ramsay theory". But in other cases they will say, "This research on photonics has potential benefit eventually in telecommunications", or whatever, and that I believe is what has stimulated applicants to say, "I will go and talk to the companies to see whether they wish to engage with us".

Q241 Dr Harris: I understand; I accept that, and you have this paragraph or aspect because it stimulates that thinking and that does advise the process, which is a good thing. Should you not do the same for Science in Society issues because there is a need for science to do that?

Professor Mason: We do.

Q242 Dr Harris: Should you not do the same for career development issues, and I know Professor Mason is interested in this, because there is a real problem, particularly with the gender balance, in some of the research councils, including two represented here? Why stop at knowledge transfer and, if you do, it is in Science in Society? Why not look at this again and say, "Right: if we want to change the thinking and put it in grant applications we will do it for all the things that it is necessary for", not just pick on one where you appear to be under more pressure from the Government and industry to do it?

19 April 2006 Professor John O'Reilly, Professor Ian Diamond, Professor Keith Mason and Professor Philip Esler

Professor Diamond: If you take, for example, ESRC, with our larger centres that we fund, the passage of development and career development are absolutely critical things that we ask our potential centre directors to highlight how they will add to those, so where appropriate—and again I absolutely deliberately use the words “where appropriate”—in our funding schemes we do ask for a portfolio of activities, but the fundamental point that I return to if I may is that the absolute criterion for funding is the brilliance of the science.

Q243 Dr Harris: That was not the point I was making. I was talking about using the grant application as a way of catalysing. We can return to it at another point—

Professor O'Reilly: It exists on our form for any applicant. We do not mandate it. It is encouraged and the way it works in EPSRC is that anyone who receives a grant from EPSRC can apply for additional top-up training in relation to training in the engagement process in the Science in Society arena. So where they have a post-doc and a grant and they see an opportunity, it is an automatic thing and they are encouraged to do it.

Q244 Dr Harris: My final question is about the definitions of knowledge transfer. We are told on the one hand where you can spot that there is a difference between RCUK and the different research councils. The External Challenge Panel seem to think that yes, that was a problem but it was probably best that it was not made too narrow at this point. Does it matter? Are you confident that everyone knows what we are talking about and that the chase for a common definition is pointless, or do you think there is merit in that now?

Professor Diamond: I think the chase for a simple, one-line common definition is perhaps an academic debate if you wish to have one. What there is is an important breadth of knowledge transfer activity which this country, as John earlier said, has to become as renowned for as it is renowned for the knowledge creation, and the actual breadth of that definition I think has already been highlighted by the responses that you have had from four research councils here, so I think it better personally that we identify all we are trying to achieve and we make sure that we achieve it as effectively as possible.

Q245 Margaret Moran: We have heard evidence from, amongst others, the CBI that the research councils do not have sufficient in-house expertise to deal with knowledge transfer. We have also heard suggestions in the previous sessions that perhaps it is not just a question of training all staff in research councils but that maybe there should be intermediaries with business skills as between the research councils and those organisations involved in knowledge transfer. What is your view of that? If it is in the negative, what would you propose to do?

Professor Diamond: If I might speak for ESRC, you will have seen in the Challenge Report that we have been praised for our use of retired business professionals to act as intermediaries. It has been

very helpful there with ESRC in starting to engage some of the conversations that I think are essential. Certainly we would not claim within house to have all the expertise to do that, so the use of research brokers for ESRC has been extremely effective and will continue to be part of our strategy.

Q246 Adam Afriyie: John, you were talking a bit earlier about the need to communicate with business and to interact with business, and I note that many of the staff recruited in research councils are from outside the academic sector, which obviously must be a right move. Was this a carefully considered strategic decision, and if so, what do you consider the advantages but also the disadvantages of recruiting from outside the academic sector and so on?

Professor O'Reilly: I think the strategic decision was to say that we needed to have a breadth of expertise within our staff. We can do that partly at the recruitment stage—so recruiting from a spectrum. That was one of the ways in which we were addressing that. The other is to do it through training and experience. In addition, we have had people engaged in secondments as part of our ongoing process to develop this rich spectrum of expertise. Indeed, we view it as valuable that this is both ways. You will find that we have taken secondments from industry into the research councils for a short period for them to gain greater understanding of where we are and then send some of our people back into that company to learn the other side. I do think that is really important. This transfer thing sounds too much one-way if we are not careful! It is about a shared understanding of something quite complex that is what we are trying to achieve.

Q247 Adam Afriyie: In the same way, it strikes me that you do not appear to have a team that is dedicated to knowledge transfer, so is that another strategic decision?

Professor O'Reilly: Yes.

Q248 Adam Afriyie: Again, what are the benefits and also the disadvantages of not having a dedicated knowledge transfer team?

Professor O'Reilly: That is a strategic decision. We are evolving, but what we feel is important is that we embed it solidly within the bulk of what we do. To be blunt, if we were to have a team the risk would be that it was small; over here and ghettoised, if you see what I mean. It is far more important than that—and far more effective to embed this solidly in what we do. You will find that a lot of my staff, who you would not say are primarily there for knowledge transfer, are engaged in our knowledge transfer activities—particularly in our business sector work. We have a whole raft of things that we do with industry sectors. Just recently—and it is stimulated again by the ten-year framework and the things that came from that (I previously mentioned the two key output targets, essentially the research and the better exploitation)—what we have just done in a reorganisation following consideration is to set up

 19 April 2006 Professor John O'Reilly, Professor Ian Diamond, Professor Keith Mason and Professor Philip Esler

two very senior level co-ordinated roles within EPSRC. One is to focus on the core research and the other to focus on the business of better exploitation. I am giving them teams of people, not 100% of a person but a set of people, where a significant fraction of their time will be to work with that co-ordinator to make sure that it is strongly embedded right across the councils and in what we do. That is the approach we are taking and it was, as you say, Adam, a conscious strategic decision to do it that way.

Q249 Chairman: Can I quickly say, John, that Bob and I were in Israel a couple of weeks ago at the Weizmann Institute and what was an interesting concept there was that they had a separate company which dealt with the knowledge that was coming out of their basic research, a delegated company whose job it was to broker all that information. Clearly that is an idea which has been taken up elsewhere. Is that something you feel should become standard practice across the research councils?

Professor O'Reilly: Chairman, I do not think it is. You will find that exists in some research councils—for example essentially that is what MRC have with MRC Ventures. That is appropriate for the intellectual property (IP) which is created by their own scientists in their own institutes. Part of their funds also go into universities, then the IPs is in the universities, and you will find that universities themselves have those entities. That is where we are at. If you now look at EPSRC as not having institutes, and consciously and deliberately operating with the universities, we are very keen to enable the universities to make the best use of the intellectual property that is created by their scientists and engineers with the funds that they win through the excellence competition.

Q250 Bob Spink: I want to look at the schemes for knowledge transfer and the co-ordination between the different research councils on this. John already explained that the research councils are quite different and a varied set of bodies, so it is not surprising that there will be a few different schemes or even several different schemes. There are very many schemes, and the Campaign for Science and Engineering found from the BBSRC website that there were 14 different schemes. They talked about fragmentation and confusion. Do you think there is fragmentation and confusion?

Professor Diamond: I do not think there is. It is not only the nature of the heterogeneity between research councils but the nature of the heterogeneity of need at different stages of the research life course for different schemes, so that if we did not have a wide variety of schemes then one would need to serve you one pot and say, "Well, come in with whatever". I think by having a wide variety of schemes what one is able to do is to identify areas which we know have been seen to work in the past and which are useful in moving forward. It also enables research councils, where there is the opportunity, to work together,

and RCUK's knowledge transfer group identifies areas for working together, for example, the business plan competition.

Q251 Bob Spink: I will come on to the knowledge transfer group in a moment. I think it is rather novel that you are arguing somehow, or you seem to be arguing, this macho demand that each one will have a different scheme in different circumstances, that there is this massive variety of schemes which is enabling people to work together it seems rather a novel argument.

Professor Diamond: If I may, it is not a novel argument. What I am saying is that in research councils we have appropriate schemes for appropriate parts of individual research councils. Where appropriate we work together across research councils. There are a number of examples where groups of research councils are working together on one scheme and that is a good thing. You would not expect that to happen across the entire piece.

Q252 Bob Spink: Is there anywhere within the whole range of research councils someone who has looked at all these different schemes, all the different models and the environments in which they are operated and come up with some sort of report on whether there is a need for all these different schemes or whether there is some good practice to be seen, some commonality and some co-ordination that could be gained?

Professor Diamond: That is precisely what the knowledge transfer group does.

Professor O'Reilly: The answer is yes, they do that. What I would say, Mr Spink, is, first of all, let me put my position to you. My ideal research council has only one scheme, so I am with you on that, but it is a scheme which is infinitely flexible. Let me underscore that last word; flexibility is the issue. Lincoln said something like, "Important principles may and should be flexible". He was right, and in this that is where we are. I have found that whilst my ideal is one scheme and getting people to use the flexibility within it, it is often very, very helpful to have something specific that people can relate to in order to stimulate change. That is often where an individual scheme has come about. It is about stimulating the change. We introduced co-operative awards in science and engineering as a form of studentship and then evolved that into Industrial CASE where we have allocated these to the industry to evolve the change and so on. Over time these things come and then go and it is a changing landscape. Let me go back to "flexible". That is what is important for working together. It does not matter that we have different schemes so long as we have the recognition of the value of coming together and the willingness to be flexible to do it. And then the different schemes are ways of stimulating people to realise what they can do. This is an area, I am afraid, where so easily people—and I am talking about our colleagues out there in the university system—operate on the basis of—if we are not careful—and "obviously if it is not specifically allowed then it is

forbidden". We have to send the message that it really is allowed: it is the other way round as far as we are concerned.

Professor Mason: In PPARC we operate exactly such a thing, a single fund with infinite flexibility. Coming back to the point which Dr Harris made on the knowledge transfer plan, that is part of the purpose of the knowledge transfer plan, so we can identify exactly what the needs of particular programmes are and steer them in the right part of this flexible space and into the right funding mechanism for that particular activity.

Q253 Bob Spink: We have got to play devil's advocate, and we have got to ask these questions and test you on these things. Clearly, Ian, you feel that the knowledge transfer group is useful, effective and performing a decent purpose at the moment. What are its current goals?

Professor Diamond: The knowledge transfer group is one of a set of RCUK groups which brings together the leads on this particular area of knowledge transfer to share best practice, to identify areas where there is the opportunity to work together and where those opportunities have been identified, to take them forward and maximise the effectiveness of them. I think it is doing pretty well in those areas. It is a group which has been going for a couple of years and which is on an upward trajectory. I hope, Mr Spink, that as we meet over time we will agree that it is really working effectively to become a focal point for RCUK activity.

Q254 Bob Spink: I am sure it will. You have not given us specific goals and I would not expect you to have them off the cuff, of course.

Professor Diamond: I would be very happy to send you the terms of reference.

Q255 Bob Spink: But it will presumably have a set of objectives that it is working to. If you can let us have it, that would be great.

Professor Diamond: I will send those to you.

Q256 Bob Spink: How does RCUK help research councils to achieve knowledge transfer? Would anybody like to speak up on that?

Professor O'Reilly: With RCUK it is important to recognise what it is. RCUK is the research councils working together. The question is, "How do research councils working together help us to achieve our objectives in knowledge transfer?" I have rephrased it because that is what RCUK is. Then it is blindingly obvious, is it not?—which is the sharing of best practice between research councils.

Q257 Bob Spink: Do not do an Evan Harris on me!

Professor O'Reilly: You see where I am at, Mr Spink. Once you realise that is what RCUK is, then the rest follows.

Professor Diamond: Mr Spink, we do work together and we do talk at all levels together. The knowledge transfer group is an example of RCUK because it is eight research councils working together and identifying best practice together. We as chief

executives meet again and work together as research councils. This is an area where we have identified that it would not be appropriate to have one unit trying to do a one-size fits all model because of the wide variety that I hope we have enriched you with today, but it is an area where we do believe it is important that we do meet and work together. As John has said, the RCUK is research councils working together and this is an area in which we do work together.

Q258 Chairman: How do you know you achieve anything? Why is it not just a glorified talking shop where you have a nice luncheon?

Professor Diamond: Chairman, you could very, very easily look at a long list of activities which have been achieved by getting together, identifying potential opportunities for partnership, identifying best practice and then taking them forward.

Q259 Chairman: Tell me one outstanding achievement?

Professor Diamond: If we take the business plan competition, research councils are working together to deliver this. As we said to you there is one example of something that came out of the competition which has now gone into production and is being taken forward. The business plan competition is an example of research councils working together, crossing boundaries and showing an opportunity for the community to work. There are other areas where it would not be appropriate for research councils to—

Q260 Chairman: Mr Spink's question was specifically about RCUK.

Professor Diamond: RCUK is the group that brings that together. As John said, RCUK is research councils working together, bringing research councils together, enabling best practice to be identified and where appropriate working together as sets of research councils.

Professor O'Reilly: I will give another response very briefly. I think it is a culture change, Chairman. The fact that it exists means that almost whatever comes up we ask ourselves, "Is this something where we should work together?" rather than get started and then afterwards saying, "Maybe we can fit this". It does not mean that we always have to do things in lockstep, but it has produced that culture change.

Q261 Chairman: A single research council would streamline all this?

Professor O'Reilly: No, I have said this before. A single research council would have a whole raft of divisions, they would be as different as the different directorates in NSF. It is my observation, and I have said it to this group before, that the research councils in the UK work together far more effectively than do the individual directorates within NSF.

Q262 Adam Afriyie: An eminent scientist once commented that: "By observing experiments you affect the outcome", so my concern is with how knowledge transfer activity is being measured,

19 April 2006 Professor John O'Reilly, Professor Ian Diamond, Professor Keith Mason and Professor Philip Esler

particularly through the use of metrics, and what effect that has on the outcomes of research universities and research councils. The first question is what process did the research councils use to identify the metrics? I will start with Ian.

Professor O'Reilly: Can I chip in and applaud the penetration of quantum theory into our discussion, if I might.

Professor Diamond: Oddly, I was going to ask for the reference afterwards, I thought it was very good. It is a very helpful question. As John has already said, the development of explicit metrics was driven to an extent by the 10 year framework and a very good thing too. What we agreed was that there should be a matrix of metrics which reflected different aspects of the knowledge transfer agenda and that each research council would have individual metrics within that matrix which reflected their own activities and that recognised the breadth of activity. The way of development was through RCUK meeting with the Office of Science and Technology and individual councils meeting with the Office of Science and Technology, developing metrics which were appropriate for that individual council and working together so as to minimise the heterogeneity that existed. That was a process which went forward. It was also agreed that this would be a process that would not expect to be finished and, if you like, get 100% certainty within the first round, but we would learn from that over the first couple of years and fine-tune metrics over time to get the best metrics. As Philip has already said, these are metrics which are not all quantitative—some obviously will be, the amount of money that is spent or the number of follow-on grants that you give—but others are much more qualitative and some require a mix. I think the relationship we have with the Office of Science and Innovation has been very helpful and that we have been able to develop these as appropriate for each council through an ongoing interactive process.

Professor Esler: Just repeating what I said earlier, from our perspective, to an extent we are interested in knowledge transfer as the enhancement of social capital. It is not something that is readily subjected to quantitative assessments, so obviously qualitative measures are the things that we are interested in. Sometimes things can be subjected to quantitative assessments. For example, when the National Gallery had its Raphael Exhibition a year or so ago it was extremely popular and a hard economic survey was conducted. We financed the person who did the catalogue so we had a direct impact. The hard-headed economic assessment later on was that the increased value to the UK from the exhibition was £20 million. There are more than two sides to this issue of measuring impact and output.

Q263 Adam Afriyie: John, are you satisfied that during the formation of these metrics the right players were consulted? We have talked about the Office of Science and Technology, now the Office of Science and Innovation, and the research councils, but was business actively involved and were the right players consulted with?

Professor O'Reilly: Business was involved, at least in the following sense. These were targets that were agreed between the research councils and the OST, now the OSI, and that was what we set out. You ask yourself, "How was business involved?" You have to understand how business is involved in the research councils. Every research council, I think, certainly in the case of EPSRC, is not made of academics, it has industrialists and other people from business there. In the case of EPSRC we have two top-level advisory panels. The technical opportunities panel is largely academics and the user panel is drawn essentially from business. We went to those with them. We went back to those as a sounding board which gives us that balanced perspective. The important thing is, "Did we get a reasonable balance?" If you take that across the councils you look at all the different stakeholders that they interact with and that were working for them.

Q264 Adam Afriyie: Why is it that during our inquiry we have heard lots of criticism about the lack of detail in the Output 2 metrics in particular—the impact on the economy? How do you respond to some of that criticism?

Professor O'Reilly: I would acknowledge, and I suspect others would acknowledge, that Output 2 was the more difficult. It is new to try and get metrics on this. If I go to academia and say, "How do you want to be measured?", they will have answers. They know for all the reasons that we have said. We have been measuring research, productivity and excellence in research for many, many years. As Dr Harris has said, it is new for the research councils to start trying to get those sorts of measures on kt, and it is new, I think, for business to ask themselves the question, "How should we be measuring our interaction with academia?"

Q265 Adam Afriyie: I think one distinction that business makes very clearly is between whether you are measuring the outcomes or you are just measuring activities. Is there a danger, perhaps, in some of these metrics that you are measuring activities but not the outcome of those activities.

Professor O'Reilly: What we sought to do was to get things that were measurable in the qualitative as well as the quantitative sense. But in many cases we recognised that there needed to be leading indicators—that they were not themselves direct measures of the outcome—because it is outcomes you are interested in. You have to recognise that some of these things have very long timescales on them. Indeed, one of the things we have done to complement the metrics is produce time-line studies which provide examples of this. I think we have probably sent some time-line studies to you, Chairman, and I would encourage you to look at them and think about what that means in terms of the sort of measure you can then get. You have to go for leading indicators in many of these cases.

Q266 Dr Harris: There is a huge tension, is there not, business outcomes generally do not distort bottom-line, profit, market-share, those sorts of things, they

19 April 2006 Professor John O'Reilly, Professor Ian Diamond, Professor Keith Mason and Professor Philip Esler

are usually consistent and it is hard if you are improving to be doing something wrong, but it is different here. Whatever you measure the principle that you enunciate from quantum theory—which I hope is consistent and not infinitely flexible in this case—is that as soon as you set a metric it will distort activity. There is an argument for not having all that detail in Output 2 because it is going to distort. If you measure inventions then you will distort towards that or patents or whatever it is. How do you solve that problem?

Professor Diamond: Surely that is the whole reason for having a variety of metrics and a set of cells under outputs that are not having one output because as you have a variety what you would expect to see at any time is a variety of trajectories and some moving up. As John has rightly said, the time-line here can be so immense that you do need leading indicators as well as outputs. If you accept that all your leading indicators are going in an upward direction then you will see improvements in the outcomes over time.

Professor O'Reilly: Just to pick up this point. It is right at the moment, of course, if we had only one measure. Then, “tell me how you are going to measure me and I will tell you how I am going to behave” applies. We understand that. Diversity is important and we are not trying to shoe any individual into all of those, or each one. You can have that phrase that was used earlier “a balanced portfolio”. I put it like this in terms of research, and it goes to the heart, Chairman, of some of these divisions between basic, strategic, applied, what is knowledge transfer and so on. I am going to focus on research now. A lot of research is developing on directly what was there before. Incremental, if you like, although that is sometimes used in a pejorative sense which I think is inappropriate. But some of it, for example, should be in research projects where when an expert looks at them there is a sharp intake of breath and they say, “I am not sure about that, I am not sure that is the way to go”, but on reflection they say, “But if it is, if that does follow through as they have conjectured, then the implications are very great indeed”!. That is another example of why you must not have it all in one. That is it has to be part of a balanced research portfolio. And, therefore, the diversity of ways of measuring and assessing things need to be there in order to capture that richness.

Q267 Adam Afriyie: It seems to me that if the metrics are produced correctly and if they are inline with whatever the policy of the Government is at the time, potentially there are huge advantages to the economy. The question is how will the Output 2 data, these metrics, be used in the medium term by the research councils in terms of directing funding? Are we going to have a lot of data up on wall-charts and do nothing with it?

Professor Diamond: We will certainly, I hope, have some data on wall-charts but doing nothing with it is not what research councils are about, if I may submit. We will be using this to monitor the directions that we are going in a set of activities. It comes back to what I said to Mr Harris much earlier when he said, “This is a motherhood and apple pie

statement that you have given us”, and I said, “Yes, in short we all agree that it happened but there have got to be some activities underneath that”. We have got a set of activities and they will be operating on different metrics in different ways and we will be monitoring how the activity is going. We will be using that to fine-tune and change some of our funding areas in terms of knowledge transfer. For example, the business plan, competition is really proving to be an excellent initiative in terms of development, “Let us put some more money into this” or “Let us fine-tune it”. We will be using that to develop our activities in this area. I think that is a very good thing. What we will not be doing is just putting it on the wall and saying, “Aren't we doing terribly well?”

Q268 Adam Afriyie: The alternative danger is if, for example, in a particular period of time there is a huge increase in academics transferring to business and then in another period of time there is a huge increase in the number of business people transferring to academia. Surely that will make you respond and change what you are doing to affect those metrics?

Professor Diamond: If we take that one in particular, we start to see those sorts of trends simply moving—

Q269 Adam Afriyie: Neither of those are necessarily an indicator of any better or worse economic performance or outcome.

Professor Diamond: We would need to understand what it was. The indicator comes up and the first thing you do is understand why that is and then you take strategic decisions with your council and with other councils as to whether you need to intervene in that particular market. That is what we will be doing.

Professor O'Reilly: You need to look at the two outputs together as well. You are right. We have mapped them as if these things were separable, Output 1 and Output 2. But some of what you were indicating I would put more with some of the metrics in Output 1, about whether we had a healthy science and engineering base. An example; it has been very, very difficult for universities to recruit really top rank chairs in economics because of the pull of the city. So we have put in investments to help them in that area because we need a healthy base before we can get the better exploitation and yet you can immediately see the relevance of that through to better exploitation.

Professor Diamond: John has mentioned about chair level, very rightly, but investments have gone right down as far as increasing stipends for PhD students to encourage people at the beginning of their career that research is a real opportunity for the very best brains in the country and we have got to do that. It is by looking at those kinds of indicators, Mr Afriyie, that we have been able to then bring interventions into place.

Q270 Chairman: Ian, you have given an impression—and perhaps I am a bit grumpy this morning—that all is well as far as knowledge

transfer is concerned in the research councils and in Research Council UK, but that the criticisms, however, which we have received as a Committee are really quite stinging. Let me give you three. GSK: "RCUK do not appear to be particularly proactive in seeking input from industry"; CBI: "Currently engagement and communication with business users would appear to be patchy"; QinetiQ: "Communications are predominately to inform rather than to listen or gather information"; and the External Challenge Panel claims that end-users are marginalised in the funding process. They are fairly stinging criticisms which are coming from the business end of this. How do you respond to those?

Professor Diamond: I am sorry that you are having a grumpy morning, Chairman! What I hope my colleagues and I have given you this morning is a view that knowledge transfer is extremely important to us, that we are enthused by it and that we are working hard on it.

Q271 Chairman: This is saying that you do not engage with them.

Professor Diamond: I would also be very clear in saying that we are always looking to develop and improve our activities in every area and I think one area is in communication. Chairman, you gave us a quote from QinetiQ and yet John has already given you an example of how EPSRC works very closely with QinetiQ on the joint funding of a chair in this area. We would see it as terribly important to take the responses that have come to this Committee and to see them as an opportunity for us to review our activities in exactly the same way, Mr Afriyie, as I gave you a response as how we would deal with the metrics to say, "Okay, are there areas that we need to take further?" Some of that might be communication and working with industry, and if that is the case then we will do that. I do want you to feel that this is an area that we take very seriously and which we are enthused about and which we have teams working on, but we would not claim that everything in the garden is lovely and we are just ticking along and everything is fine.

Professor Esler: We are very keen to engage especially with the creative industries and we are doing so. You have to recall that we have a rather different landscape here. In general, companies working in the creative area tend to be fairly small; often they could be four or five people. We visited one in Dundee recently, a small company producing three quarters of Sky TV's interactive content and that was five or six people. There are thousands and thousands of them. We face the problem of how do you interact with so many people. Using the RDAs is one method that we have begun to employ. Secondly, we have this task group on research and knowledge transfer where we have a number of industry representatives. One of them, for example, is from the Computer Games Industries Association, who has helped us run an event which was very, very significant. We are enthusiastic to do this but the characteristic of the creative industry being so distributed makes it quite a challenge.

Q272 Chairman: John, one of the other criticisms was that there is a huge emphasis on, if you like, the technology push out of the universities rather than technology pull. Do you think that is a fair criticism?

Professor O'Reilly: I do not think it is a fair criticism. I think it is the case that, as I said earlier, there is a chain right the way from the knowledge creation generation stage, identification stage, through to exploitation and that research councils rightly are focused more at the front end of that rather than at the back. I think there is a consideration, "Where are we in the chain of this?" What I would say about the business comments that you have had, Chairman, is I am confused by some of them because of the attributions. I know within those companies we have some excellent engagements, including them having served on our panels and so on. I would be very sure that for each company where you have a negative comment I would be able to go and find someone, without telling them what to say, where they would say, "I have got experience of really good engagement". That does not address the issue of perception. If that is the business perception of EPSRC, then EPSRC will address it. Because I recognise that perceptions, if left unaddressed, are real in their consequences.

Q273 Dr Iddon: Some companies like AstraZeneca and QinetiQ think that the only way to achieve the Government's set figure of 2.5% GDP investment in R&D will only be achieved if we push the small and medium enterprises, which Philip has mentioned, to engage in more research and development, in other words, that is the growth area. But other people like GlaxoSmithKline believe that we should concentrate on the successful in order to get to that figure. I would like your opinion on that because the Government seems to have made more money available for SMEs through the Small Business Research Initiative. I want to know how you are going push the SMEs because that is what the Government seems to think we should do. Are you inviting them on to your panels? What sort of processes are you engaging them in? The RDAs have been mentioned but what are the research councils doing?

Professor Diamond: The research councils are taking a lot of initiatives, and I am sure my colleagues would be able to give different initiatives. Certainly engaging with the SMEs is an important priority. Indeed, there has been a major increase in SME activity in R&D in this country and we have to continue that happening. Certainly we have brought SMEs into the ESRC, into panels, and also researched on SMEs and the way in which they can work most effectively in this area. I am sure John and Philip, in particular, will want to respond.

Professor Esler: One aspect of our engagement with them has been to look at knowledge transfer partnerships, which of course is a very successful programme right across all the research councils. Our problem is that it generally takes 18 months to three years and a company with five or six people cannot afford that level of engagement. We are seeking to address that by having a smaller scheme

which will allow a six month period, or even a three month period. Certainly we are in discussion with people in the computer games industry that would allow them, even with quite small staff complements, to engage very actively in the universities, many of which they have just come out of. It is difficult but it is something we are addressing.

Professor O'Reilly: It is important to consider both—and sometimes to consider them together. What I mean by 'both' is, as you said is it large or small? You are right in terms of government support and I think it is right too that there should be stimulation of that because of the importance it has to the economy. One of the ways in which we are looking to bring those two things together is to operate down the supply chains. Very often smaller companies are in the supply chain of a larger business, so where we have got a strategic partnership with a large organisation, such as BAE Systems, for example, we are working with them to make contact with companies that are in their supply chain and then to foster direct research grant interactions and training in those, bringing it all together. I would say that the large companies, such as BAE Systems, are very keen that we should engage in that way because their future relies on the innovation in their supply chains. Increasingly, large businesses are systems integrators with the innovation further down in the small companies.

Q274 Dr Harris: I would like to come back to this issue of knowledge transfer in the grant applications and look at some of the funding issues. Professor Mason, for PPARC, can you clarify, given what you have said already without repeating that, whether that aspect of the grant applications is included in the peer review process for deciding whether it is worth funding?

Professor Mason: It is not in the main peer review process, so there is a scientific peer review which does not look at the knowledge transfer aspects, but there is a separate review of that by a separate body with experts in that area.

Q275 Dr Harris: Keith O'Nions told us that there are no plans to insist that what you have said will change but that he noted that the National Science Foundation in the United States has had this as a routine part of their application for many, many years. I think it is up to the peer review panels and the peer review process to look at that and make their judgment. Do you think that is going to change? Is it going to change consistently if it changes, or will it be a couple of research councils moving to include that thing?

Professor Mason: Across the research councils there has been for a number of years, as John illustrated, the requirement to state what the end-user was and that is seen by the main peer review process. What we have done in PPARC is put this extra layer to focus people down on to the potential for knowledge transfer and to make sure we spend the resources in the appropriate way and target it on the areas which can most benefit.

Q276 Dr Harris: I understand that, but that is different from deciding whether to allocate funding on the basis of that being part of the peer review process.

Professor Mason: Yes, and as I said previously, that is not part of the decision to fund or not to fund.

Q277 Dr Harris: Sir Keith also told us that he expects to see research councils' support for knowledge transfer increase. It is hard to see how that can happen without biasing—I use the term biasing, but I do not mean to bias what I am saying—the peer review process towards funding more knowledge transfer, more applied—accepting what you say about not liking the word “applied”—applications, all other things being equal, unless you expect there suddenly to be a switch in applications towards more transferable things.

Professor Mason: I think you have to be clear about the size of the application. We spend perhaps only 1% of our budget on “direct knowledge transfer issues”, in other words, brokering and funding knowledge transfer per se. A much larger fraction, perhaps 20–30%, of our budget goes into things that lead to knowledge transfer ie the funding of industry.

Q278 Dr Harris: He was talking about 1%, was he?

Professor Mason: Yes. For PPARC, for example, we are increasing the amount of money we put into these direct knowledge transfer things from £2.2 million a couple of years ago and we are increasing it by about 60%. It is on an upward trajectory but it is still a very small fraction of the total budget. Like I say, this is focused on enabling and brokering to make the knowledge transfer activities more efficient and more targeted.

Q279 Dr Harris: Finally, you say you have no plans to put the knowledge transfer aspect formally into the peer review in the way that I have painted the scenario, but you do accept that you are being lobbied? For example, the 1994 group of universities—not even industry—says: “Knowledge transfer needs to be made an integral part of grant approval, monitoring and the review process”. What you are saying is that they will be disappointed by your current and immediate plans in this area.

Professor Mason: I think what we are doing is putting together a system which is intelligent enough to deal with the different requirements. We have a purely science peer review stage which decides whether something is fundable or not and we have a separate element that looks at the knowledge transfer aspects and identifies where funding can be best used to fund direct knowledge transfer activities making sure that happens in the most efficient way. That is a separate activity which is then brought together in an overall strategy. As I said right at the beginning, for PPARC that overall strategy is important because the knowledge transfer aspects are essential to the future health of the subject.

19 April 2006 Professor John O'Reilly, Professor Ian Diamond, Professor Keith Mason and Professor Philip Esler

Q280 Dr Harris: Professor Diamond, when QinetiQ say: "Funding criteria need to be adjusted to incentivise applied science", they are not, judging by what has just been said, going to get everything that they want in that respect because peer review for the grant applications are still going to be based on scientific questions, not knowledge transfer questions?

Professor Diamond: You are right. The best knowledge transfer is only going to come from the absolutely impeccably brilliant science, so you have to start by making a judgment, as we will continue to do, that we are funding the very, very best science.

Professor O'Reilly: That statement was made by a member of QinetiQ to the economic impact group and she was representing the CBI at the time. The other two business representatives who were with her said, "I do not agree with that". It does not mean that one is right or wrong, it means there is a diversity of views and you are hearing some of them.

Q281 Dr Iddon: The final question is on intellectual property rights and how we handle them. Earlier it was mentioned that MRC technology handle IPR in that medical field in one way but most research councils now have taken a hands-off approach and left it to the universities. Of course, this was mentioned earlier, some of the universities have excellent mechanisms for transferring knowledge into the public sector. Do you think this hands-off approach is working or have we a long way to go to improve it? It seems to me that some universities are very good, Warwick and Imperial College are outstanding examples, other universities do not seem to have even thought about it.

Professor Diamond: I think there is a role for the research councils in helping universities where they wish to formulate policies, but certainly when we fund higher education institutions then the higher education institutions give intellectual property. Our role is very much in helping where it is appropriate. Dr Iddon, it is also worth remembering, before I pass over to John, that in many areas of industry, a diverse set of areas of industry, including Phillip's area and some of those covered by my own, intellectual property regulation is not a key area. In the fashion industry, for example, people do not worry too much about a patent on their latest dress. The business model is very, very different. I think we have to reflect that and to help across those different areas.

Professor O'Reilly: I think that last point is very important. It is easy to focus on the simple things that can be measured; how many patents are there and what has happened to them—and you miss so much if you do that—or how many spin-outs are there. That was flavour of the month a while back, was it not? And the Lambert Report focused on it and said, "Actually, there are other ways of exploiting IP". I would go with what Ian has said on that.

Chairman: Professor Diamond and colleagues, can we thank you enormously for a very long session, one that I hope you have enjoyed as much as we have.

Professor Diamond: As ever, it has been our pleasure and we look forward very much to your report which we hope will enrich us and enable us to think forward on how we take this exciting area.

Chairman: Thank you all very, very much indeed for your time this morning.

Written evidence

APPENDIX 1

Memorandum from the Office of Science and Technology, Department of Trade and Industry

RESEARCH COUNCIL SUPPORT FOR KNOWLEDGE TRANSFER

“Following the DTI Innovation Report recommendation, Research Councils UK (RCUK) is developing an overarching knowledge transfer strategy and each individual Research Council will agree with the Director General of the Research Councils (DGRC) plans and goals for increasing the rate of knowledge transfer and level of interaction with business. These new targets will become an integral part of the OST performance management system for the Research Councils and performance against targets will inform future spending reviews.”

Science and Innovation Investment Framework 2004–14, July 2004

EXECUTIVE SUMMARY

Knowledge transfer is an important component of the Government’s ten year Science and Innovation Investment Framework: the UK is strong in research but needs to be more effective at translating the products of research into economic and social benefits. As part of this framework, each Research Council has submitted a knowledge transfer plan, the key elements of which are now incorporated in the Delivery Plans as part of their high level objective on better exploitation of research results. Knowledge transfer is a wide term and encompasses a wide range of activities from commercialisation of research through collaborative research and people exchange. Certain funds have been specifically earmarked for knowledge transfer in Research Councils, although these do not reflect the fact much knowledge transfer takes place as an integral part of research. Research Council activity needs to be seen in the wider context of a range of Government support for innovation including HEIF, R&D tax credits and the Technology Strategy. The Research Councils’ plans for knowledge transfer are evolving—they have recently been subject to external challenge and the Director General of the Research Councils is currently looking at how Research Councils could deliver a major increase in the economic impact of their investments.

INTRODUCTION

1. The Government’s efforts to increase knowledge transfer are based on a recognition that science and innovation are key to ensuring the UK’s long-term competitiveness in an increasingly knowledge driven global economy. In all countries, economic activity is shifting toward innovation and knowledge driven industries. We rely more than ever on generation of knowledge and effective access to knowledge. The UK has a historic strength in scientific research but needs to build on this to exploit new technology-driven and high value added areas and secure its long-term prosperity in the face of global competition.

2. The current Government has placed a major emphasis on science and research as a driver for economic growth and have delivered a major increase in funding through the science budget. In 1997–98, the science budget was £1.3 billion. As a result of substantial increases in a number of spending reviews, the science budget will have more than doubled in real terms to £3.4 billion by 2007–08.

3. In July 2004, the Government published a ten year Science and Innovation Investment Framework setting out the Government’s ambition for UK science and innovation over the coming decade, in particular their contribution to economic growth and public services, and the attributes and funding arrangements of a research system capable of delivering this. The Framework put a particular emphasis on increasing knowledge transfer between the research base and business. There are a number of different ways in which such knowledge transfer is supported—the Research Councils play an important role, but certainly not the only one.

Why is Knowledge Transfer Important?

4. Knowledge transfer is one aspect of the ten year plan which seeks to increase the responsiveness of the UK science base to the needs of the economy. This is in line with the recommendations of the 2003 Lambert review of business-university collaboration.

5. The Lambert review concluded that the UK was strong in research, but less effective at translating the products of research into social and economic benefits, though he highlighted the rapid change taking place. The ten year science and innovation investment framework 2004–2014 set out to encourage greater responsiveness of the public funded research base to the needs of the economy and public services, focussing especially on two targets:

- continue to improve UK performance in knowledge transfer and commercialisation for universities and public laboratories to world leading bench marks; and

- Research Council's programmes to be more strongly influenced by, and delivered in partnership with, end users of research.

DEVELOPMENT OF KNOWLEDGE TRANSFER IN RESEARCH COUNCILS

6. The DTI Strategy published in September 2003 identified as one of five key priorities the need to strengthen knowledge transfer from business to business and between business and academic communities and other knowledge creators and providers. Following on from this, the DTI Innovation Report, published in December 2003, set out how the Director General Research Councils would agree with each of the Research Councils plans and goals for increasing the rate of knowledge transfer and the level of interaction with business, and that these plans would be subject to external challenge.

7. Each Council was invited to submit a plan including targets in five key areas: interaction with business/public service, collaborative research, user involvement in education and training, people and knowledge flow and commercialisation of R&D. Councils submitted their knowledge transfer plans at the end of 2004. This marked the first time that the Councils had explicitly codified their vision and goals for knowledge transfer. At the same time as these plans were being developed, the Research Council were moving to a new system of performance management. As part of this, the key elements of the knowledge transfer plans were incorporated into the overall Delivery Plans that were published in May 2005. These Delivery Plans clearly set out that the Councils are working to two high level objectives—the first, excellence of the research base, the second improving the exploitation of the research. Each Council has also agreed a measurement framework—and the Output Two framework sets out indicators of knowledge transfer and business interaction.

8. Knowledge transfer is very much an evolving area and the plans are not set in stone. We fully expect Councils to adapt the plans and raise their sights as they become more adept at knowledge transfer.

KNOWLEDGE TRANSFER—A WIDE TERM

9. The term knowledge transfer is used to cover a wide, loosely defined range of activities that aim to increase the impact of research institutions beyond the academic research community.

10. It can encompass the classic “technology transfer” or “commercialisation” role where intellectual property from research is protected and then developed into a new business (spinouts) or the rights sold to existing firms (licensing). But it also goes much wider, including secondments of staff to business and other users, support for collaborative research, supporting student placements in business, promoting entrepreneurship among research communities through business plan competitions, providing advice on UK research strengths to potentially interested parties. The whole field of KT is still evolving and excellence is not well defined and benefits appear in many different ways.

11. The Government's policy is that the aim of knowledge transfer should be to benefit the UK economy as a whole—and not necessarily the host institution. Knowledge transfer is not merely a new or substitute source of funding for institutions—it is an attempt to ensure the benefits of the research can be more fully realised by economic factors.

12. Knowledge transfer should not be seen as simply a one way process. Academic researchers should also be able to benefit from greater interaction with business and users—as they learn from business, broaden their knowledge base and get opportunities to tackle more relevant problems (and some commentators prefer the term “knowledge exchange” to more clearly capture this feature). A knowledge transfer mission and a research excellence mission are not mutually exclusive: stronger KT and consideration of use can mean a deeper/wider research excellence.

KNOWLEDGE TRANSFER FUNDING

13. The form of support for knowledge transfer reflects the diversity of goals. In the Research Councils there are earmarked lines of funding available: £2.5 million has been set aside to increase the management capacity relating to knowledge transfer in Research Councils and RDAs; £15 million was set aside to give a special boost to knowledge transfer activities, and the Public Sector Research Establishment Fund has recently allocated £25 million to a range of knowledge transfer projects, many of which were in Research Council Institutes. But simply adding up earmarked funding would be to downplay the importance of KT. The science budget allocation shows some 3% of budget has been earmarked for knowledge transfer, but a much wider range of knowledge transfer activity takes place as an integral and seamless part of research. Effective knowledge transfer is woven into the fabric of research rather than taking place separately. Knowledge transfer may translate established, rather than new, research results into economic benefit, for example in companies that do not operate at the cutting edge of technology.

14. The increasing support for knowledge transfer in the Research Councils needs to be seen in the wider context of increasing Government support for knowledge transfer from the research base. In particular, the Government has already made major investments in improving university business interaction: the University Challenge (£60 million over two rounds) programme provided universities with seed corn funds

to improve their ability to commercialise research; funding for Science Enterprise Centres (£43 million over two rounds) provided access to entrepreneurial skills to science and engineering undergraduates and graduates and the Higher Education Innovation Fund (which is rising to £110 million per year by 2007–08) provides incentives for universities to transfer knowledge to the economy across a broad range of activities. In addition, the Government has been supporting commercialisation from other public sector research establishments (PSREs) through a dedicated funding stream for those PSREs (£25 million over 2006–07 and 2007–08).

15. This support is already paying dividends. An evaluation of Government schemes show they are leading to real culture change within Higher Education. And we are seeing a significant rise in key metrics of University business interaction—as demonstrated in the table below:

	1995–06	2002–03
Contract research income from business	£170 million	£262 million
New patents granted	45	371
Licences granted	139	758
Income from licences	£12 million	£37 million

16. Furthermore, it is notable that the combined value of university spinouts floated on stock markets in the last two years is over £1 billion—larger than the cumulative funding for knowledge transfer since 1997.

17. And in addition to the direct support for knowledge transfer from the research base, the Government is also supporting a range of measures to promote innovation, consistent with the ten year framework:

- RDAs growing engagement in supporting business innovation as part of their Regional Economic Strategies, as reflected in rising total investment in science and technology activities (some £360 million in total over 2005–06) and in the RDAs new tasking framework, with specific targets for increasing business interaction with the UK knowledge base.
- DTI Technology Strategy, which is funding an array of business-relevant collaborative R&D programmes and knowledge transfer networks, with the potential for universities to become part of these networks.
- R&D tax credits for large and small businesses, under which R&D contracted out to universities is eligible for tax credit, thus reducing the net cost to businesses.
- Science Research Infrastructure Fund SRIF3, under which research capital funding is given on condition that HEIs develop greater access to facilities for business.
- A range of Innovation support schemes, such as Knowledge Transfer Partnerships, Grant for R&D and Global Watch.
- The development of the Science Cities concept in Manchester, York, Newcastle, Bristol, Birmingham and Nottingham, involving close partnership between HEIs, city authorities and RDAs with the aim of enhancing the impact of HEIs on the economic growth of city-regions.
- Government-supported venture capital measures, in particular the new Enterprise Capital Funds, which received state aid clearance from European Commission this week.

18. It should be noted that in many cases Research Councils activity is integrated with this wider support. For example the Research Councils are represented on the Technology Strategy Board, to help take account of research base strengths and weaknesses in deciding on technology strategy priorities, and to ensure that Councils are able to react to these priorities. Further information is attached as an Annex.

19. Historically, Research Councils have voluntarily contributed to the Small Business Research Initiative—designed to help small and medium enterprises (SMEs) gain greater access to publicly funded R&D contracts. Following the announcement in the Budget by the Chancellor of the Exchequer that the SBRI scheme will now be mandatory, the Research Councils will promote a Small Business Research scheme (similar to but distinct from SBRI). They are committed to spending at least 2.5% of a baseline of £815 million in 2005–06 on university/SME collaborations and directly with SMEs.

Looking Ahead

20. As envisaged in the Ten Year Framework, the Research Councils agreed that their knowledge transfer plans should be subject to an external challenge from a group of relevant stakeholders, including business public sector and former Council staff. An External Challenge panel was appointed by Research Councils UK on behalf of the Councils, and this panel benefited from presentations by each of the Councils. At the time of writing this submission, the panel were finalising their report to the RCUK Joint Strategy Group.

21. All of the Councils have made progress in putting in place plans to increase the amount of knowledge transfer and business interaction. But the Government believes there is a need for a further improvement.

22. The Director General of the Research Councils has asked a small ad hoc group of experts to advise him over the coming months on how Research Councils could deliver—and demonstrate that they are delivering—a major increase in the economic impact of their investments.

February 2006

Annex A

RESEARCH COUNCIL INVOLVEMENT IN WIDER INNOVATION SUPPORT SCHEMES

KNOWLEDGE TRANSFER NETWORKS

1. Knowledge Transfer Networks (KTNs) help to facilitate business access and investment in science, engineering and technology.

2. Research councils are beginning to engage with KTNs at a strategic level, for example PPARC, supported by CCLRC, the UK Atomic Energy Authority and the current network partners (National Physical Laboratory and Sira) has formulated an Advanced Instrumentation work package that extends the current remit of the Sensors KTN. The work package provides specific focus on 'high end' scientific instrumentation for industry and academic research and its percolation into the broader markets of analytical, process, test & measurement and quality assurance / control. The Research focuses on the engagement of industry with the scientific research infrastructure in terms of access, knowledge transfer and supply opportunities. KTNs also have access to EPSRC Industrial Cooperative Awards in Science and Engineering (CASE) Awards, which are studentships allocated to companies participating in EPSRC funded research.

Knowledge Transfer Partnerships (KTPs—formerly known as the Teaching Company Scheme)

3. KTPs enable high calibre, recently qualified graduates or 'Associates' to work in a company on a project that is core to the strategic development of the business.

4. KTPs is truly a cross-Government initiative with six out of eight of the Research Councils providing around £3.5 million funding per annum. KTPs work alongside AHRC, BBSRC, EPSRC, ESRC, NERC and PPARC with the aim of offering a holistic package of business support.

Collaborative Research and Development

5. Collaborative Research & Development (CRD) seeks to produce successful new products, processes and services to help drive forward innovation and create prosperity for the UK economy. The latest round of the Government's £370 million Technology Programme dedicated £63 million to UK businesses in six priority areas.

6. Research Councils have made significant efforts to engage with the Technology Programme and have contributed both to the development of the Technology Strategy and its implementation, for example, by providing evidence of strengths in the UK science base and RCUK technology priorities. Research Councils are important partners offering support for academic participation in research projects, increased levels of co-funding and the development of joint application and assessment procedures for future Technology Programme Calls.

7. EPSRC has committed funding to date of around £1 million and will continue to commit around £7 million per annum for the next three years. BBSRC has allocated £2 million for 2006–07 and MRC is to commit future funding on a case-by-case basis.

European Framework programme

8. The European Union's Sixth Framework Programme is the EU's primary funding mechanism for supporting and encouraging collaborative research and innovation in science, engineering and technology in the European Community.

9. The Research Councils consider the scale of funding and the focus of research support within the EU Framework Programmes to be of significant importance to the UK science and engineering base. The Research Councils have been involved in negotiations governing the development of Framework Programmes and their management, and in raising awareness of EU opportunities in research and education programmes.

Information on specific activity can be found in the following publication:

www.ukro.ac.uk/public/pub/uk-research-councils—20-years-in-europe.pdf

GLOBAL WATCH SERVICE

10. DTI's Global Watch Service helps to improve the competitiveness of UK businesses by identifying and accessing innovative technologies and practices from overseas.

11. The majority of the Research Councils are involved in the Global Watch Programme and regularly attend the 'Missions' dissemination events. Research Councils also interact with the Global Watch International Technology Promoters on a regular basis. For example, MRC was a member of an Oncology Mission to Scandinavia and PPARC was part of a group taken to CERN.

Glossary and Web Links

AHRC—Arts and Humanities Research Council

<http://www.ahrc.ac.uk/>

BBSRC—Biotechnology and Biological Sciences Research Council

<http://www.bbsrc.ac.uk/>

CRD—Collaborative Research and Development

<http://www.dti.gov.uk/crd/>

CCLRC—Council for the Central Laboratory of the Research Councils

<http://www.cclrc.ac.uk/>

EPSRC—Engineering and Physical Science Research Council

<http://www.epsrc.ac.uk/>

ESRC—Economic and Social Research Council

<http://www.esrc.ac.uk/>

FP6—European Framework Programme

www.ukro.ac.uk

KTN—Knowledge Transfer Network

<http://www.dti.gov.uk/ktn/>

KTP—Knowledge Transfer Partnerships

<http://www.dti.gov.uk/ktp/>

MRC—Medical Research Council

<http://www.mrc.ac.uk/>

NERC—Natural and Environment Research Council

<http://www.nerc.ac.uk/>

PPARC—Particle Physics and Astronomy Research Council

<http://www.pparc.ac.uk/>

RCUK—Research Councils UK

www.rcuk.ac.uk

APPENDIX 2

Memorandum from Research Councils UK (RCUK)

CONSULTATION BY HOUSE OF COMMONS SCIENCE AND TECHNOLOGY COMMITTEE ON RESEARCH COUNCIL SUPPORT FOR KNOWLEDGE TRANSFER

Research Councils UK (RCUK) is a strategic partnership that champions the research supported by the eight UK Research Councils. Through RCUK the Research Councils are creating a common framework for research, training and knowledge transfer. Further details are available at www.rcuk.ac.uk.

RCUK welcomes the opportunity to respond to this consultation from House of Commons Science and Technology Committee¹

¹ <http://www.parliament.uk/parliamentary—committees/science—and—technology—committee/scitech011205b.cfm>

This memorandum provides evidence from RCUK in response to the main topics and questions identified in the consultation document, in addition to supplementary views from:

Arts & Humanities Research Council	Annex One
Biotechnology and Biological Sciences Research Council	Annex Two
Council for the Central Laboratory of the Research Councils	Annex Three
Engineering and Physical Sciences Research Council	Annex Four
Economic and Social Research Council	Annex Five
Medical Research Council	Annex Six
Natural Environment Research Council	Annex Seven
Particle Physics and Astronomy Research Council	Annex Eight

Selected highlights of the impact of knowledge transferred from Research Councils' programmes:

- *DNA finger printing*: early Research Council support for Professor Sir Alec Jeffries at Leicester University, which led to the development of genetic fingerprinting with its subsequent impact on crime detection.
- *Satellite control*: Software developed to control space missions such as the Huygens probe to Titan has underpinned multimillion pound commercial contracts for the company.
- *Bioprocessing*: For the first time in the world a new technique (developed at a Research Council's centre), will significantly improve the speed to market of a therapeutic protein by increasing the capacity of a crucial early stage step by seven fold.
- *Terahertz Technology*: Research Council support for terahertz technology played a prominent part in the creation of TeraView Ltd, the world's first company solely devoted to the commercial exploitation of Terahertz light. TeraView has pioneered many applications of Terahertz, eg cancer imaging, and is constantly exploring new markets, such as drug discovery and formulation and security screening. TeraView has opened up an entirely new market segment in pharmaceuticals—the online inspection of tablets in a non-invasive manner not possible by other means. In addition Thruvision, a Research Council spin out, is aiming to become the leading commercial provider of compact security screening equipment using terahertz imaging technology and is generating substantial commercial interest with a range of security products.
- *Health impacts*: basic research funded by the Councils has demonstrated the following major health impacts:
 - Established that smokers lose a decade of life compared to non-smokers.
 - Showed that surgery for stroke can halve the risk of a subsequent one.
 - Demonstrated that screening for abdominal aortic aneurysms is cost-effective, saving over 3,000 lives after four years in the 65–74 age group.
 - Showed that cholesterol-lowering drugs can reduce the risks of heart attacks and strokes by at least one-third.
- *Antibody technology*: research in antibody engineering started in the mid 1970s and resulted in patents covering a series of inventions during the late 1980s and early 1990s for making "humanised" or fully human monoclonal antibodies. These technologies have had a major impact on health and the economy, with eleven therapeutic antibody products now on the market including treatments for breast cancer, leukaemia, infant respiratory disease, asthma, psoriasis, kidney transplant rejection and rheumatoid arthritis
- *Economics*: The World Bank uses research funded by the Councils to advise Government's on R&D tax credit schemes.
- *Better livestock transport*: animal welfare has been enhanced by determining the environmental features required to minimise stress in animals during transport. These findings have been incorporated into EU legislation.
- *Thames Barrier*: providing the data required to inform decisions on when to raise or lower the Thames Barrier. The cost of getting this wrong would be £30 billion and many human lives.
- *The arts*: funding researchers who co-curated of the National Gallery's successful Raphael exhibition.
- *Development of Lagan Weir*: (one of the largest civil engineering projects ever to be undertaken in Northern Ireland): Model tests on the Lagan Weir using research techniques developed through Research Council research, demonstrated that Laganside could be developed without the risk of flooding. This has led to riverside developments up to this date of over £1,000 million.

ROLE OF RESEARCH COUNCILS IN DELIVERING GOVERNMENT INNOVATION OBJECTIVES

1. The Government's vision for science and innovation is that the UK should be one of the most attractive locations in the world for science and innovation, being a key knowledge hub in the global economy, with a reputation not only for outstanding scientific and technical discovery, but also a world leader at turning that knowledge into new products and services.

2. Research outputs, training and sources of new knowledge and technology are the raw materials which power successful innovation. The Government recognises that substantial investments in basic research are needed to generate this knowledge, partnered with investment to strengthen links with business and drive innovation, which will in turn increase UK productivity and attract more inward investment into the UK. This is reflected in the DTI's Public Service Agreement Targets for the Science Budget, which are:

- *Output 1:* to maximise the impact of the investment of the Science Budget on maintaining and improving the UK's research base.
- *Output 2:* to increase the contribution made to improving exploitation of the research base to meet national economic and public service objectives.

3. As well as support for research and training, each Research Council also has a specific knowledge transfer responsibility in their Missions. Whilst there are sector specific differences, and additional responsibilities for CCLRC, ESRC and MRC, the basic remit is to:

“advance knowledge and technology (including the promotion and support of the exploitation of research outcomes), and provide trained scientists and engineers, which have potential to contribute to the economic competitiveness of Our United Kingdom and the quality of life, through meeting the needs of users and beneficiaries (*specified industrial sectors*)”

4. The Research Councils are committed to playing their part in achieving the Government's objectives for innovation, working with other key players including the private sector, HEIs, RDAs and Government, to build on their successful track record in supporting knowledge transfer.

THE RANGE OF RESEARCH COUNCILS' KNOWLEDGE TRANSFER ACTIVITIES

5. Each of the Research Councils supports research and training across a wide range of academic disciplines. There is strength in the diversity of this system, with each Council providing a strong focus for their research and user communities. Consequently each Council has a varied and diverse set of stakeholders and users, ranging from large multinational companies to SMEs and from policy makers in Whitehall, the regions and in Europe to the NHS, the Met Office and museums and galleries.

6. In developing their thinking about knowledge transfer the Councils have agreed a shared definition of knowledge transfer:

“The UK Research Councils seek to accelerate the two-way flow of people and ideas between the research environment and wider economy, and thereby contribute to national prosperity, the quality of life of UK citizens, and cultural enrichment of our society. Knowledge Transfer encompasses the systems and processes by which knowledge, expertise and skilled people transfer between the research environment (universities, centres and institutes) and its user communities in industry, commerce, public and service sectors.

7. The Councils agreed to group these activities under four non-exclusive headings and to develop their plans and targets within them:

- Co-operation in education and training at masters and doctoral level.
- People and knowledge flow.
- Collaborative research with users.
- Commercialisation including IP exploitation and entrepreneurial activities”.

8. In delivering their knowledge transfer responsibilities, each Council has developed strategies, processes and approaches which reflect the breadth of science and research supported, the particular characteristics of each Council's user communities and the size of the Research Council's budgets.

SUMMARY OF RESEARCH COUNCILS' SUPPORT FOR KNOWLEDGE TRANSFER

User and stakeholder engagement

9. Each of the Councils has developed their knowledge transfer strategies and approaches in consultation with their major business and research user groups. User input is sought and accessed through a wide range of mechanisms including:

- business and user representation on each governing Council;
- business or user led high-level advisory groups eg EPSRC's User Panel or BBSRC's Bioscience for Industry Panel;
- business and user membership of Councils' peer review colleges and peer review panels;

- Funders forums;
- Concordat's with Government Departments;
- regular dialogue with companies, CBI and trade associations; and
- seminars, workshops and conferences with user groups.

10. Specific challenges exist in a number of sectors. For example, the interplay between creativity and technology in the creative industries requires different knowledge transfer models than those of traditional manufacturing industries. The AHRC is leading a Task Group on Research and Knowledge Transfer within the Creative Industries/Higher Education Forum at the Department of Culture, Media and Sport. This Group seeks to identify the challenges and opportunities in knowledge transfer activities for the creative industries sector. It has facilitated the formation of strategic partnerships between the research base and creative industries and has undertaken research to identify and define appropriate models of knowledge transfer for the creative industries and the arts and humanities research base. PPARC is different again. As the areas of science it supports depend on advanced technologies, PPARC places a strong emphasis on brokering relationships with industrial sectors which act both as technology supplier for research programmes, as well as a customer for knowledge transfer. For example, in preparing for UK participation in the ESA Aurora programme of Mars exploration, PPARC held a workshop on the technical and industrial opportunities created by Aurora, and invited proposals for early stage technology studies.

Collaborative R&D

11. All of the Research Councils support collaborative R&D with a variety of users including business, charities and Government Departments. Where appropriate this enables potential end users of the research to shape the overall priorities and direction of that research and helps to ensure that the research base is responsive to the needs of the economy. As well as transferring outcomes from basic research, such collaboration with business helps to deliver new knowledge which may benefit future research and helps companies innovate and may lead to further commercial opportunities.

12. Individual Council collaborations include:

- AHRC has established a strategic R&D collaboration with BBC New Media. This collaboration brings arts and humanities researchers together with BBC staff to address R&D needs in the areas of mobile/portable interactive devices, passive consumption/active engagement; user generated content and managing media assets.
- BBSRC and EPSRC are co-funding a £10 million research programme in Bioprocessing with 18 companies who are contributing collectively £1 million. The aim is to address strategically importance research problems which underpin the efficient production of biopharmaceuticals which comprise over one third of all new drugs in development.
- EPSRC has established 17 Innovative Manufacturing Research Centres (IMRCs) representing an investment of £80 million. IMRCs are expected to attract matched funding (mostly in kind) from industry partners. The IMRCs currently collaborate with over 1,000 companies, many of them SMEs. A recent review found a high level of satisfaction for the IMRCs amongst industrial collaborators, primarily because the significant levels of long-term funding enable the development of more strategic relationships and plans, and the ability of the IMRCs to respond quickly to business needs.
- MRC and BBSRC are co-funding, with the Funding Councils and three pharmaceutical companies, a £12 million initiative in Integrative Mammalian Biology. The aim is to enhance research and training in the physiology and pharmacology of animals.
- BBSRC has recently announced (September 2005) a £11 million initiative in the area of Crop Products and Processes to bring about more effective translation of research on model species into crop plants. A further £1 million is available for research in collaboration with industry, in particular, with breeders of wheat, the most important UK crop.
- EPSRC runs the "Ideas Factory" an approach that brings together multidisciplinary teams of researchers and users for a week long "Sand-pit" to address significant business or societal challenges. Topics have included maintenance and renewal of the buried infrastructure, gun crime, closing the productivity gap and bridging the digital divide. Successful collaborative ideas which emerge from the sandpits draw down from an earmarked sum of £1 million.
- EPSRC has developed a number of strategic partnerships with companies and other organisations, to enable leading researchers to focus on user led strategic requirements. One is example is the £30 million strategic partnership between EPSRC and BAE systems which supports long-term basic research in the aerospace and defence sector.
- The collaboration between the MRC Protein Phosphorylation Unit and the University of Dundee's School of Life Sciences is £21.5 million collaboration with seven companies including GSK, AstraZenca and Pfizer. The research being funded is aimed at speeding up drug development for major diseases including diabetes and some cancers and has created 20 new scientific posts.

13. Research Council institutes also undertake a substantial volume of contract research in partnership with Government, industry and a range of other users which help to build collaborations between the private and public sectors. For example:

- CCLRC's Space Science and Technology Department (SSTD) has 80 contracts running with industry, to the value of around £6 million this financial year. This includes substantial contracts to supply instrumentation for satellites into industry, a leading example being a multi-million dollar contract from Lockheed for a NASA satellite.
- The British Geological Survey (BGS) is one of the organisations involved in monitoring and modelling the distribution of injected CO₂ in the Utsira Sand. The Statoil Sleipner project was the world's first demonstration of carbon dioxide capture and underground storage. It is of great interest to the international community because if the concept can be applied to power stations it holds out the promise of making deep cuts in global CO₂ emissions—without having to abandon fossil fuels. The monitoring BGS is undertaking is to check that the CO₂ is behaving as predicted and is not migrating out of the intended storage site. This type of demonstration will do much to satisfy future legal verification requirements and allay public concerns about safety issues.
- Centre for Ecology and Hydrology (CEH) scientists and partners completed the biggest experiment of its kind in the world, designed to test the effects of growing Genetically Modified herbicide tolerant crops on biodiversity. The findings of this research are shaping Government policy in the UK and in Europe on decisions over commercialisation of a number of crops, and ensuring that other stakeholders, including UK industry are well informed. Scientific research of this kind is essential, particularly given the contentious nature of the debate on Genetically Modified Organisms (GMOs).
- CCLRC commercial interactions include partnership with Intel to benchmark their processors on a broad spectrum of scientific applications and with AMD to explore life science applications of their hardware. Most recently the CSED have partnered AstraZeneca in a £300K three year contract to undertake high performance computing simulations for drug formulation.

14. The Councils currently invest £40 million in the 24 Faraday partnerships. These are alliances of organisations and institutions, which can include research and technology organisations, universities, professional institutes, Trade Associations and companies. Each Faraday Partnership focuses on a technology of importance to the UK dedicated to improving the competitiveness of a specific business sector through more effective interaction between the research base and the industry. The original 24 Partnerships include more than 300 university teams and 2,500 companies. Faraday partnerships are now being developed by the DTI into the Knowledge Transfer Networks scheme as part of the Technology Programme. The first RC engagement in KTN sponsorship has just been announced.

15. The majority of Councils are, or have been co-funders of LINK programmes, the Government's principle mechanism for supporting collaborative research between UK industry and the research base, prior to the establishment of the Technology Programme. Each LINK partnership is an alliance of organisations from academia and business, and more specifically technology translators—people with broad experience of technology transfer who can facilitate projects between partner members. Examples include:

- The Ocean Margins LINK programme, co-funded by NERC, is designed to focus the research challenges facing the industry in exploring for, and developing deep-water oil fields.
- The Advanced Food Manufacturing programme, co-funded by BBSRC and EPSRC, is exploring advanced manufacturing techniques for the food industry, to allow greater process flexibility and reduced energy use and waste generation.
- EPSRC co-funded the Waste Minimisation through Recycling, Re-use & Recovery programme. This funded research into the recycling and re-use of materials within processes and plant and recovery of products and components in a wide range of processing and manufacturing sectors.

16. The Research Councils have voluntarily contributed to the Government's Small Business Research Initiative (SBRI) targets. Following an announcement in the 2005 Budget, the Research Councils will promote a Small Business Research scheme (similar to, but distinct from, SBRI). The Councils are committed to spending at least 2.5% of a baseline of £815 million in 2005–06 on university-SME collaborations. Allocations have been, and will continue to be, made throughout the year with Councils advertising funding opportunities on their individual web sites.

17. On a smaller scale, Councils also wish to encourage industry awareness and partnership in responsive mode grants. BBSRC have introduced an Industrial Partnership Award (IPA) scheme, through which all research proposals that have obtained a 10% cash contribution from industry will be funded provided they reach a quality threshold.

Cooperative training and education

18. Nearly all the Research Councils run a CASE PhD studentship scheme and offer other targeted user-relevant training. Collectively the Research Councils fund some 10,000 PhD students, of whom approximately 25% move into the private sector upon completion of their PhD. This proportion varies by discipline, for example 48% of all PPARC students take employment in the private sector, including the City, major industrial companies and small IT companies.

19. Of the PhD students supported by the Councils, some 3,000 students are being trained collaboratively with industry through the CASE studentship scheme involving over 500 companies and users ranging from Reebok UK to BP to County Councils. The well-established CASE studentship scheme provides PhD students with training in both an academic and commercial or user environment. A number of Councils are also working with the RDAs to help bring these training opportunities to the attention of SMEs.

20. The Councils also support specific training initiatives such as the Biotechnology Young Entrepreneurs Scheme, which provides training in commercialisation for postgraduate and postdoctoral bioscientists. Research has shown that graduates participating in this scheme are twice as likely to take employment in the private sector as their peers, and a number have already launched their own companies.

PEOPLE AND KNOWLEDGE FLOW

21. Individuals are at the heart of knowledge transfer. All of the Councils aim to encourage increased levels of university business interaction and all support the exchange of researchers between academia and industry and broker partnerships between business and researchers. For example all fund industry fellowship (or equivalent) schemes which enable academics to undertake research in a business environment and which allow private sector researchers to undertake research or course development work in a university.

22. The Research Councils fund and promote Knowledge Transfer Partnerships (KTP) to enable collaborative partnerships between the research base and industry, particularly small and medium sized technology companies. Under the scheme high calibre graduates and postgraduates are recruited to work on innovative projects within industry and are jointly supervised by the participating industrial and academic partners. The industrial partner gains access to the latest technology and research developments, whilst the academic partner benefits from working with business on real problems and the researcher develops greater business awareness. AHRC is developing a shorter, more flexible precursor KTP aimed at small and medium sized businesses and micro enterprises.

23. Research Councils play an important role in providing knowledge to inform policy development. This is particularly important in the economic and social sciences where ESRC has strategic partnerships with ten government departments and all three devolved administrations. It is also an important component of the activities of BBSRC and NERC in providing advice on the environment and agriculture to underpin government policy. For example, the work of the BBSRC Institute of Animal Health on FMD impacted government policy on handling the foot and mouth disease outbreak. NERC is leading the field in farm scale evaluation of GM crops. The arts and humanities too make a fundamental contribution to key areas of public policy and wider public understanding. Through enhancing our understanding of ourselves and our world, the impact is felt in areas of public policy as diverse as law, ethics, media and communications, ethnicity and cultural diversity, language and language technologies, and creativity and innovation. For example AHRC is taking the lead on a new cross-Council initiative, the focus of which will be upon the theoretical and empirical knowledge of societies, cultures and identities based on ethics, religious, historical, linguistic factors and other socio-economic indicators such as demographics. By taking this approach, AHRC is ensuring that the causes of terrorism are addressed by taking account of a broad spectrum of factors, and that technology is appropriately harnessed to combat and respond to it.

24. Following SR2004 OST will be providing the Research Councils with additional funding of £20 million from 2006–07 to enable them to strengthen their delivery of their knowledge transfer activities. Of the £20 million, £5 million is earmarked for Councils to increase their knowledge transfer (KT) capacity. This is being matched with equivalent funding to the RDAs.

25. Specific Research Council activities aimed at promoting knowledge flow include:

- PPARC runs the Knowledge, Innovation, Technology and Enterprise (KITE) Club which is an active programme of brokering and networking to increase the awareness of industry and other users and the academic community of each other's strengths, needs and opportunities. This takes place through a programme of visits and workshops and supports an innovation advisory service to broker partnerships between researchers and business. Other PPARC activities include a workshop with BBSRC to link astronomers and biologists which has led to a series of collaborative projects to transfer imaging technologies into biological research.
- AHRC is launching a new national Research Exchange Network for arts and humanities researchers and knowledge transfer professionals. The Network will offer opportunities to engage and collaborate in the exchange of research knowledge within and outside academia.

- ESRC runs the CONNECT Club which facilitates social and economic research findings directly to senior policy makers in central and local government, business and financial sectors and the voluntary sector amongst others.
- Three BBSRC institutes provide bio incubator facilities, which have been developed with support from the RDAs. The bio incubator at the Babraham Institute has been particularly successful with eighteen companies on site.
- CCLRC is investing in campus development projects at its laboratories at Harwell and at Daresbury, which will offer new environments for collaborative research and people exchange. Over £50 million has been invested at the Daresbury campus by the NWDA creating 24,000 sq ft of laboratory space. To date, seventeen high technology companies have been attracted to the site with another four planned. A similar development is planned at the Rutherford Appleton Laboratory at Harwell.

26. OST will be providing the Research Councils with additional funding of £20 million from 2006–07 to enable Councils to strengthen their delivery of their knowledge transfer activities. Of the £20 million, £5 million is earmarked for Councils to increase their knowledge transfer (KT) capacity. This is being matched with equivalent funding to the RDAs.

Commercialisation

27. Research Councils delegate the responsibility for the management and commercialisation of IP arising from the research funded to the research organisation, usually an HEI. To encourage universities to build entrepreneurial environment and undertake the commercialisation of research, the Councils support an increasingly wide ranging portfolio of activities, including IP awareness training and enterprise fellowship schemes (eg BBSRC and PPARC in co-operation with the Royal Society of Edinburgh, fund Enterprise Fellowships which provide salary and training for individual academics whilst they commercialise work originally supported by the Research Councils).

28. BBSRC, EPSRC, NERC and PPARC invest in the “Follow on Fund” which provides funds to enable researchers to demonstrate the commercial potential of ideas arising from research supported by these Councils. Proof-of-concept funding allows scientists the often small amounts of funding needed to demonstrate the commercial potential of their ideas. For example MRC development gap-funded work led directly to a substantial collaboration between the MRC Laboratory for Molecular Biology and Pfizer on G-protein receptors, an important class of drug targets.

29. Once commercial potential has been demonstrated, Research Councils can help scientists to develop robust business plans through the cross-Council Business Plan Competition. This helps UK based researchers to develop their ideas for commercialising research outputs by providing training and mentoring in the development of business plans and entrepreneurial skills. There are examples of many successful companies which have benefited from taking part in the competition (Thruvision, Neurosolutions, Orla).

30. Those Research Councils with their own institutes all have well established means for commercialising and exploiting the research they fund:

- BBSRC formally transfers ownership of IP to its institutes through the conditions of its grants. This is in line with government policy and the recommendations of the 1999 Baker Report to Treasury. In order to encourage management of IP on a portfolio basis, BBSRC has invested in an exploitation company, PBL, to handle commercialisation across the four plants and microbial science institutes. BBSRC’s institutes hold 244 patents, have spun out 13 companies and, over the last four years, have generated exploitation income exceeding £7 million. Last year BBSRC institutes were involved in over 200 industrial consultancies involving some 160 separate companies. The Paracox vaccine, developed at BBSRC’s Institute of Animal Health to control parasites in poultry, has now yielded over £1 million in royalty income.
- CCLRC established Central Laboratory Innovation and Knowledge Transfer (CLIK) Ltd in 2002 to professionally manage the commercialisation of CCLRC’s IP. To date CLIK has established six spin-out companies in a wide range of market sectors including medical diagnostics and industrial sensors. These companies have already attracted approximately £6 million in external investment and currently employ 30 people. In addition, CCLRC’s Computational Science and Engineering Department (CSED) is developing its commercial interests with the establishment of Daresbury Analytical Computing Services (DAComS) the commercial brand through which it promotes the commercial exploitation of CSED facilities and software.
- Evlutec was spun-out in 1998 to develop some biopharmaceutical discoveries made by NERC scientists. The development of the company’s platform technology has been based upon the characterisation of proteins found in tick and other parasite saliva. These proteins have great potential for medicine as they have evolved over time to have very specific responses to a host’s inflammatory response. Over-reactions by the immune system, such as certain autoimmune diseases and allergies, are possible therapeutic targets for the proteins identified by the company. Evlutec was listed on AIM in August 2004 with a capitalisation of £12.7 million.

- The MRC exploitation company, MRCT, generated exploitation income of over £20 million in 2004–05 (equivalent to 9% of research expenditure in MRC institutes and units, which is more than three times the proportion achieved overall by US universities). In 2005 MRC received £112 million from a deal with Abbott to allow them to use MRC-protected technology for making humanised monoclonal antibodies to produce a drug, HUMIRA, for the treatment of rheumatoid arthritis. Two of the largest UK biotechnology companies, Celltech and Cambridge Antibody Technology, originated as start-ups based on MRC technologies, and fifteen other start-up companies have been formed which, excluding Celltech, employ 1,135 staff).
- NERC employs a number of “exploitation scouts” to identify and develop early-stage commercial opportunities and has put in place a partnership with ISIS Innovation, one of the UK’s leading university technology transfer organisations, to manage IP arising from four of their main institutes. NERC also provides its researchers with access to an innovation fund to help bring commercial opportunities to a point where they can be successfully licensed or attract external finance to establish joint ventures or spinout companies. The Innovation Fund enables researchers to obtain funds for the very earliest stages of a new business opportunity, supporting, for example, obtaining a patent or buying advice on market size. A successful example of commercialisation is Evlutec, a spin out company set up in 1998 to develop therapeutic products based on the characterisation of proteins found in tick and other parasite saliva, which could be used to treat certain autoimmune diseases and allergies. Evlutec was listed on AIM in August 2004 with a capitalisation of £12.7 million.

31. Following the Baker Report in 1999, OST established a PSRE fund, which provides funding to enable Public Sector Research Establishments (PSREs) to develop their capacity to exploit their science and technology potential and to provide seed funding to support the very early stages of business formation from ideas emerging out of research. The Research Councils are eligible to apply to this fund and several have been successful in their bids:

- PPARC is using its PSRE3 award of £893,000, together with funds awarded under previous rounds, to promote inward knowledge transfer from CERN (the European Laboratory for Particle Physics), ESA (the European Space Agency) and ESO (the European Southern Observatory) for the benefit of UK industry.
- Two of NERC’s Marine Centres have won significant funding. The National Centre for Ocean Forecasting, based at the Met Office, has been awarded £568,000 to further research into forecasting the weather in the oceans. The Sea Mammal Research Unit (SMRU) at the University of St Andrews won £381,000 to develop new commercial applications for scientific instruments used to track marine animals and to provide scientific services to the marine industry.
- BBSRC and its institutes were successful in being associated with over 50% by value of projects funded. The Rainbow Seed Fund secured £2.5 million to increase the value of the fund to over £8 million. The Fund provides seed financing to help the development of ideas originating in partner organisations to be commercial concepts. Ideas backed by the fund over the last year by the fund have included new and cheaper techniques to diagnose breast cancer and a platform for drug development. The Norwich-based IP management and technology transfer company, PBL—in which BBSRC is a major shareholder—has been awarded £1.9 million to fund market research costs, marketing costs, support a technology development fund and promote innovation activities across four BBSRC-sponsored institutes. Genecom is led by the Roslin Institute, and also covers research at the Institute for Animal Health and the Moredun Institute.

IMPACT OF RESEARCH COUNCILS SUPPORT FOR KNOWLEDGE TRANSFER AND PERFORMANCE MANAGEMENT

32. Working together in cross Council collaboration, sharing knowledge and best practice, each of the Research Councils has published a delivery plan for the period 2005–06 to 2007–08, together with an agreed set of metrics which will be used to assess progress against the two PSA output measures. The metrics for output2 “to increase the contribution made to improving exploitation of the research base to meet national economic and public service objectives” were published in May 2005. Links to each Council’s output framework can be found via delivery plans located through the RCUK website at <http://www.rcuk.ac.uk/deliveryplan.asp>.

33. Data against these metrics will be collected and published annually. The first reports will be made in June 2006. Research Councils have attempted to coordinate RCUK data with HEBI. However the level of aggregation of the HEBI data is too high to be of specific use to the Research Councils.

34. Each of the Councils also reviews their knowledge transfer portfolios and various schemes as part of routine management and evaluation.

35. Evaluating the impact of research on public policy is more challenging and cannot be addressed with metrics. In addressing this, AHRC for example is developing new approaches to impact assessment through a variety of means, including the appointment of Impact Fellowships.

36. In comparison with the US, UK HEIs generate more spin-off companies than US universities per £million of research expenditure. US universities form one spin-off for every £60 million of research expenditure compared with around £17 million per spin-off in the UK. The key role played by the Research Councils is illustrated in a recent survey by the Royal Society of Chemistry which showed that 85% of spin-outs from university chemistry departments were based on Research Council funded work.

37. The Innovation Report recommended that Research Councils' KT plans and goals for KT and innovation and their interactions with business should be subject to business led external review. The aims of this exercise are to:

- provide Research Councils and OST with an independent assessment of the strength and breadth of each Council's current and planned KT portfolio;
- establish a baseline for future assessments;
- identify best practice and opportunities for improving the effectiveness and efficient delivery of Research Council KT activities (both individually and collectively); and
- inform future spending reviews.

38. The review was held in December 2005. A panel of 10 users was assembled from across the Research Councils' user base including business; information technology; the life sciences; the creative industries; public sector; DTI; Regional Development Agencies; and the Scottish Executive. Each Council submitted report to the panel, setting out the role and responsibilities of the Council, their strategy for, and funding and delivery of KT. A team from each Council then met with the user panel to discuss their KT portfolio. Partnerships UK is preparing the report which will go to the Director General of the Research Councils and the RCUK Executive Group. This is expected to be the first in a bi-annual business led review of Research Councils' knowledge transfer activity.

COORDINATION BETWEEN THE RESEARCH COUNCILS AND THE ROLE OF RCUK

39. Whilst having varied academic and user bases, the eight Research Councils work together where appropriate across a range of knowledge transfer activities, through the RCUK Knowledge Transfer Group (KTG). KTG provides a focal point for sharing information and good practice on knowledge transfer and a hub for collective dialogue with external organisations, including the DTI, the RDA Research Innovation Science and Technology (RIST) Group, PRAXIS and the Scottish Intermediate Technology Institutes (ITIs).

40. Through KTG the Councils have actively explored opportunities for cooperation arising from their long term programmes and their new plans developed in response to the Innovation report. Examples of joint programmes include the Business Plan Competition, Follow-on-Fund, Enterprise Fellowships, KTPs and KTNs. RCUK also coordinates the presentation of the RC programmes to external stakeholders, including the production of the brochure "*Material World: Knowledge Economy*" showcasing the Councils knowledge transfer portfolio. Attendance at key events is coordinated to ensure an effective RCUK presence.

41. The Research Councils are represented collectively on the Government's Technology Strategy Board (by the Chief Executive of EPSRC), and on a number of official level DTI lead operational groups. All Councils have benefited from the Research Council secondment to the DTI (2005) in terms of "joined up" communication. The Chair of the TSB also meets collectively with all Council Chief Executives twice a year. The Councils' have also developed good links with the CBI, working collectively with their Inter-Company Academic Research Group (ICARG).

42. The Research Councils are actively engaged in the Government's Technology Programme, and participating in working groups identifying technology priorities and supporting projects from the subsequent calls as follows:

- *April 2004* (EPSRC): Electronics and displays (EPSRC); Environmentally friendly transport (EPSRC); Inter enterprise computing (EPSRC); Materials and structures (EPSRC); Renewable technologies (EPSRC); Sensors and control systems (EPSRC);
- *November 2004* (EPSRC): Design, Modelling & Simulation (EPSRC); Pervasive Computing, including Networks & Sensors (EPSRC); Imaging Technologies (EPSRC); "Smart" Materials; Bio-based Industrial Products (EPSRC & BBSRC); Opto-electronic & Disruptive Electronics (EPSRC); Waste Management & Minimisation (EPSRC); Renewable Energy Technologies (EPSRC)
- *April 2005* (EPSRC): Advanced Materials (EPSRC & PPARC); Advanced Manufacturing—Direct Write (EPSRC); Emerging Energy Technologies (EPSRC); Next Generation Lasers in Manufacturing (EPSRC); Biopharma Bioprocessing (BBSRC & EPSRC)
- Funding decisions for the *November 2005* Competition are being considered but Research Council interest in the following technology priorities:
 - Regenerative Medicine (BBSRC/EPSRC/MRC);
 - Energy—Low carbon/Oil and Gas (EPSRC);

- Data and Content (EPSRC);
- Power Electronics (EPSRC);
- Waste Minimisation /Resource Efficiency (EPSRC);
- To date, EPSRC has committed approximately £8.5 million funding towards 17 projects. EPSRC plans to commit up to £10 million pa from 2005–06 across technology areas and BBSRC has earmarked £2 million for the November 2005 and April 2006 competitions.

43. The Councils have also developed a joint peer review process with the DTI which makes it easier for organisations seeking co-funding, and which enables applicants to use the Councils' Joint Electronic Submission System.

44. The Research Councils have participated in the launch events for each of the Technology Programme calls, the Technology Strategy Stakeholders Information event and the DTI's regional road shows, aimed at stimulating business interest in the programme.

45. An important area of current RC/DTI engagement is in the identification of emergent areas of technology or emerging industry sectors that have the potential to become growth sectors of the future. The aim is to identify areas with potential (either from existing Research Council programmes such as Basic Technology or from discussions with the academic and user communities) where the community is not at a sufficiently advanced stage to seek funding through the Technology Programme, or where there is potential for research to translate across other sectors. Such areas could be developed further through small scale activities designed to build up a community and stimulate new business-academic collaborations. For example support for mini-networks, short feasibility studies or sandpits in a similar manner to the Ideas Factory.

February 2006

Annex 1

Arts and Humanities Research Council (AHRC)

RESEARCH COUNCIL SUPPORT FOR KNOWLEDGE TRANSFER

AHRC'S DEFINITION OF KNOWLEDGE TRANSFER

1. To exploit fully the new knowledge and learning that is generated in higher education institutions (HEIs), it has to be applied to areas of life where it can make a difference. This is the broad definition of knowledge transfer (KT) that the AHRC has adopted as the foundation for its KT strategy. This definition provides a good fit with the AHRC's mission and it also enables the challenges of the innovation agenda to be met as it:

- encompasses business interactions, which are of importance to the arts and humanities research base, within a broader concept of knowledge engagement;
- encompasses KT which has a business and economic focus, whilst capturing knowledge interaction with other audiences, including the public and voluntary sectors. It allows, for example, knowledge interaction with the museums and galleries and heritage sectors to be captured, as well as research that informs public policy and the enhancement of civil society;
- includes high-quality KT content for the print, film, digital and broadcasting media which is derived from arts and humanities research, as well as promoting the experience of the outcomes of this research through contemporary exhibitions and performances. The broader definition thus encompasses public engagement and understanding.

AN EVOLVING KT STRATEGY

2. The AHRC was established in April 2005. A predecessor body, the Arts and Humanities Research Board (AHRB) was in operation from 1998–2005. The AHRB was funded by the UK Higher Education Funding Councils and did not have a remit, or funds, to support and develop KT in the arts and humanities. It was only in the run-up to achieving Research Council status that attention turned to developing an AHRC KT Plan and bidding for associated funding. 2005 was the first time that dedicated KT funding became available and payments in the KT programmes in 2005–06 are forecast at £2,524,000 rising to £5,877,000 in 2007–08—an increase of 133% (see Table One below).

3. The AHRC's 10-year vision is to be recognised as the premier, innovative supporter of knowledge transfer in the arts and humanities. To achieve this ambitious goal AHRC's KT strategy includes specific plans for engagement with the creative industries and the museums and galleries sectors, plus generic strategies.

STRATEGIES TO SUPPORT KT AND THE CREATIVE INDUSTRIES

4. The UK creative industries (CIs) are a real success story. They are one of the economy's fastest growing sectors contributing over £53 billion to the UK in 2002, accounting for 8% of GDP and growing at an average of 6% between 1997 and 2002—double the rate of the economy as a whole. They encompass areas as diverse as design and music, computer games and animation, film and new media, intelligent textiles and fashion. The potential is there for the UK to become a world-class player, indeed computer games and new media are already recognised as such. The knowledge that these industries depend upon for their growth is multi-dimensional and not driven purely by technology; much of their vitality rests on the bringing together of the creative and performing arts, cutting-edge technologies, and innovative forms of business organisation.

5. The interplay between creativity and technology in these industries requires business models that are quite different from those of traditional manufacturing industries. Conventional models of knowledge transfer do not map readily onto the CIs and it seems to be the case that the character of research and the structure of these industries require new models to be developed and facilitated.

6. The AHRC is tackling this issue by leading a Task Group on Research and Knowledge Transfer that sits within the Creative Industries/Higher Education Forum at the Department of Culture, Media and Sport. This Group, chaired by the Council's Chief Executive, is now in its second and final year of a work programme that seeks to identify both the challenges and opportunities in research and development (R&D) activities for the CIs sector. It has enabled strategic partnerships to be formed between the research base and the CIs, so as to determine the requirements of the CIs and facilitate sustainable communication between industry and the HE sector. The Group has also undertaken research to identify and define appropriate models of KT for the CIs and the arts and humanities research base. The objective is to determine what works and what does not through identifying good practice and barriers to KT for different CI sub-sectors.

7. Additionally, the Group has identified potential barriers for the sector within the existing innovation support framework in the UK. Notably, it is addressing the anomaly that Government defines R&D for tax purposes as follows: "R&D for tax purposes takes place when a project seeks to achieve an advance in science or technology . . . Work in the arts, humanities and social sciences, including economics, is not science for the purposes of these guidelines."² This sits at odds with the KT remit of the AHRC, and in turn discourages businesses in the CIs from drawing on the full potential of the UK research base. The R&D and innovation needs of the CIs go beyond the application of new technologies, requiring the development of new content, narrative and understanding of user interfaces for example. The CIs sector is forced to absorb the full cost of such R&D activities at present, and that reduces its ability to innovate and compete in a global market. Challenging outdated concepts of R&D, and recommending alternatives, sits at the heart of the AHRC's KT ambitions.

8. The achievements of the Task Group in its first year of operation include:

- the broadening of the overarching criteria for Knowledge Transfer Partnerships (paragraph 14 refers) following recommendations from the Task Group to DTI to improve access for the CIs to the scheme;
- the delivery of workshops and seminars in collaboration with non-academic partners to bring stakeholders from CIs, HE and government together;
- the development of sustainable relationships with industry, KT intermediaries, HEIs, RDAs and DAs, government departments and international agencies to disseminate models and case studies of good practice in KT;
- the initiation of innovative collaborative R&D partnerships between AHRC and non-academic partners as part of the development and implementation of the Collaborative R&D Fund (Annex A refers). One such partnership, for example, is a new strategic collaborative R&D engagement between AHRC and BBC New Media.

The work of the Task Group will conclude in summer 2006 when the Group will make its recommendations to government, AHRC and other stakeholders.

STRATEGIES TO SUPPORT KT AND THE MUSEUMS AND GALLERIES SECTOR

9. The major UK museums are world-leaders and make a vital contribution to the nation's cultural, educational, social and economic life. They preserve and make available to the public collections unsurpassed in range and quality in the rest of the world. Museums in England alone attract over 77 million visits a year, and the economic impact of the UK museums sector is estimated to be at least £2 billion a year.

10. Museums also constitute a critical part of the research base for a wide range of subjects. Research in museums themselves, and research in the HE sector which flows into museums, are of crucial importance in enabling them to present and interpret their collections to visitors, through publications, and online. Research also underpins museums' work in education and learning, in inspiring creativity and innovation;

² *Guidelines for the Meaning of R&D for Tax Purposes*, DTI, HMT and HMR & Customs p1 and p3.

attracting tourists to the UK and supporting the tourist industry; contributing to social inclusion, and promoting economic and social regeneration; and generating social capital, civic, community and national pride, and good citizenship.

11. But there has been up to now no organisation whose role it has been to support research of this kind. The AHRC is set to perform this role, having created a funding programme that will establish the first-ever integrated strategy for the direct support of research in museums. Our investment will ensure that UK museums remain world leaders. It will also enhance, through exhibition and display, communication to a variety of audiences of the latest advances in understanding arising from recent research and scholarship.

12. The programme is already underway with a call for research workshops, announced in October 2005, with the aim of forming partnerships between specialists in museums, galleries, libraries and archives, and their colleagues in universities. These research workshops will provide an opportunity to discuss major arts and humanities research themes, and to focus more directly on the work of museums and galleries. The strategy as a whole will be further informed through consultation with both the museum and higher education sectors but as the programme is rolled out over the next three years, it is likely to include support for: research to underpin permanent and temporary exhibitions and displays; research in conservation and preservation; the establishment of networks across the museum and higher education sectors in areas such as fashion, history of science, archaeology, or photography; cross-sectoral exchanges and secondments; capacity-building via the funding of postgraduates in order to increase the supply of people with appropriate expertise; and research that informs us how visitors engage with the objects and displays they see, and what they learn from them, thus improving our understanding of these matters, the quality of museum displays, and strategies to enhance the impact of museums.

GENERIC STRATEGIES TO SUPPORT KT

Co-operative education and training

13. In 2005 the AHRC made its first awards under a new Collaborative Doctoral Awards scheme (akin to CASE awards) to promote partnerships and research collaboration between HEIs and non-academic partners. The scheme has proved to be of interest to businesses in the creative industries, media and design companies, libraries, museums, galleries, heritage organisations, and health trusts for example. A budget of £500,000 per annum is available for this scheme.

Supporting people and the knowledge flow

14. The AHRC plans to support individuals in KT as follows:

- In September 2005 the Council became a sponsor of the DTI's Knowledge Transfer Partnership (KTP) scheme. Our funding remit for the scheme encompasses the whole breadth of the arts and humanities research base and deliberately seeks to support knowledge transfer, as opposed to the more restrictive, traditional term of technology transfer. The community has already embraced this challenge and high-quality applications have started to flow with business partners ranging from music publishers to fashion retailers. The Council has set aside £350,000 per annum for sponsorship of KTPs.
- AHRC plans to produce an annual publication to show case KTPs in its subject domain, both to act as an exemplar of good practice, raise awareness of the scheme and to lever more exchange between the research base and the public and private sectors.
- KTPs can be a large step for a micro-enterprise engaging with a HEI for the first time (which is a typical descriptor of a company in the creative industries). In recognition of this there is scope for a precursor-type KTP scheme of a shorter duration that requires less financial investment on the part of the company. Some HEIs have experience of running their own funded schemes of this kind and report that they act as a successful stepping-stone to further, sustained engagement with the research base. The AHRC plans to establish a precursor type KTP scheme to draw SMEs into engagement with the arts and humanities research base. Consultation will commence early in 2006, so that applications can be received before the end of 2006.
- Stimulating mobility between HEIs and other sectors is another means by which the AHRC proposes to facilitate KT. The plan is to initially pilot such a secondment scheme in the museums and galleries sector as part of the AHRC's developing strategy in that area.
- In December 2005 a proposal will be put to the AHRC's Council to support a new scheme called "KT Leave". The AHRC already runs a highly successful Research Leave scheme which is unique amongst the Research Councils; it provides three or four months of salary costs to relieve an academic of all teaching and administrative duties, and this period of leave is matched by the HEI, in order to enable the academic to complete a piece of research. The KT Leave scheme, with a

proposed budget of £1.5 million per annum, would fund 80% of the full economic costs of an individual for between one and three years (but typically one) so that they could pursue KT activities. We would not be prescriptive about the activities that could be funded, but they might for example include:

- (a) working-up for wider dissemination existing resources based on research, such as video or web-based materials (in drama or dance, for example);
- (b) preparation of web-based virtual models/accounts of sites of archaeological or historical interest as an aid to actual or remote access to those sites;
- (c) preparation of web-based virtual models of exhibitions and performances;
- (d) the preparation of teaching materials (web-based or textual) for undergraduate or school use;
- (e) the provision of periods of leave for academics to work in academic or non-academic settings in relation to a particular knowledge transfer purpose.

In each case applicants would have to demonstrate their high academic standing and that the work in question would represent the dissemination of cutting-edge, top quality research. Provided that the Council approves the outline of this scheme, we intend to consult on its specification early in 2006, so that applications can be received in the autumn of that year.

Building relationships with user communities

15. The AHRC's KT strategy seeks to ensure that research in the arts and humanities engages with and informs as wide a range of "users" as appropriate. To this end activities include the introduction of a pilot dissemination scheme in 2004 with the aim of stimulating researchers to convey their research findings to wider audiences than those envisaged at the start of the project. Awards of £5,000 are available to our research grant holders to engage in this type of dissemination, which includes the commercialization of outcomes. The pilot scheme will be reviewed at the end of 2005 and is likely to be re-branded to raise awareness of the opportunities it offers and to include within it targeted funding in support of commercial dissemination.

16. The arts and humanities make a fundamental contribution to key areas of public policy and wider public understanding. Through enhancing our understanding of ourselves and our world, the impact is felt in areas of public policy as diverse as law, ethics, media and communications, ethnicity and cultural diversity, language and language technologies, and creativity and innovation. Metrics are too blunt a tool to capture such impacts and for that reason the AHRC is developing new approaches to impact assessment through a variety of means, including the appointment of Impact Fellowships. One of the three-year Fellowships, for example, is seeking to improve the quality and reliability of data about the impact of KT activities between the arts and humanities and the CIs. The major output of this project will be an intervention into developing debates about the nature of KT in the arts and humanities within the context of the CIs and an associated framework of indicators to measure activity and capture impact. This is important as KT interactions with the CIs are poorly captured by standard surveys, and this under-reporting results in the value of these exchanges being diluted.

Promoting entrepreneurship and the commercialisation of research

17. The AHRC promotes entrepreneurship and supports the commercialisation of research in a number of ways, including:

- In 2006 the AHRC will create a National Research and Business Development Network for both academics in the arts and humanities and staff in HEIs who provide KT support for them. The virtual Network will assist information flows between the AHRC and HEIs and amongst HEIs. In this way HEIs can help shape AHRC's KT strategy and good practice can be shared. A Network Manager has been appointed to start in November 2005.
- Co-funding the joint Research Councils' Business Plan competition. The AHRC made a financial contribution to the last Business Plan competition that secured entry to it for the arts and humanities research base for the first time. This community was very responsive to the challenge of the competition, submitting 32% of all the expressions of interest that were received and constituting 20% of all those invited to participate in the next stage of the competition. Five plans were short-listed, with four of the finalists being from either EPSRC or MRC's research community and the other from our community.
- The introduction of a Collaborative Doctoral Awards scheme (paragraph 13 refers).

Table One

FORECAST KT PROGRAMME PAYMENTS

<i>Activity</i>	<i>2005–06</i>	<i>2006–07</i>	<i>2007–08</i>
Postgraduate Collaborative Doctoral Awards	£395,000	£1,066,000	£1,929,000
Dissemination Scheme	£100,000	£100,000	£100,000
Sponsorship of DTI's KTP Programme	£350,000	£350,000	£350,000
"Stepping-stone" KTP scheme	£0	£208,000	£250,000
Museums and Galleries Research Programme	£0	£250,000	£1,000,000
R&D Collaborative Fund	£0	£300,000	£625,000
KT Research Leave Scheme	£1,500,000	£1,500,000	£1,500,000
RCUK Business Plan Competition	£25,000	£25,000	£0
Impact Fellowships	£154,000	£195,000	£123,000
Total	£2,524,000	£3,994,000	£5,877,000
Total planned expenditure on research	£36,658,100	£49,347,800	£59,500,300

Annex 2

Biotechnology and Biological Sciences Research Council (BBSRC)

SUPPORT FOR KNOWLEDGE TRANSFER

BACKGROUND

1. BBSRC's budget in 2004–05 was £312 million. Of this over 50% was spent on research grants and initiatives to universities, with some 30% of total funding going to eight (soon to be seven) BBSRC institutes. Support for studentships and fellowships amounted to some 11% of budget. Available metrics show that the UK bioscience research base is very strong internationally. BBSRC recognises that there are major opportunities for the UK to derive economic and social benefit from our world-class bioscience research base and in order for this to be realised, it is essential that knowledge be effectively transferred from the laboratory to potential users of that knowledge.

2. In broad terms, research and training activities supported by BBSRC in universities are more relevant to the needs of the pharmaceutical, biotechnology and chemical sectors. These industries are R&D-intensive and interact substantially with the science base. The programmes of BBSRC institutes focus on agriculture, environment, agrochemical, plant and animal breeding, and food, with one institute (Babraham) moving more towards biomedical. In general users in these sectors are less R&D-intensive, where transfer of best practice is important as well as providing evidence-based policy for government departments. The BBSRC approach to knowledge transfer (KT) endeavours to recognise the needs and characteristics of the various sectors.

3. BBSRC delegates responsibility for the management and commercialisation of IP arising from the research it supports to the research generator. For the eight BBSRC-sponsored institutes, ownership of IP is formally transferred to the institutes through the conditions of grant. This is in line with government policy and the recommendations of the 1999 Baker Report to the Treasury. Recent studies by the National Audit Office recognise substantial progress has been made by BBSRC institutes in encouraging commercialisation of research outputs.

4. Whilst details of BBSRC's support for knowledge transfer are set out in the following paragraphs, the following headlines are drawn to the Committee's attention:

- the pharmaceuticals industry is one of the biggest investors in R&D in the UK, and the UK biotechnology sector is second only to the USA. These sectors benefit substantially from access to high quality research and manpower supported by the Research Councils;
- BBSRC has pioneered a number of novel approaches to encourage commercialisation and collaboration with industry, including Young Entrepreneurs Scheme (1996), Business Plan Competition (1999), Follow-on Fund (2004) and Industry Interchange Programme (2005);
- BBSRC is significantly increasing its support whereby, in 2007–08, funding for collaborative R&D will double to £8 million p.a., support for industry partnerships increase to £4.5 million p.a., and support for KT through a range of mechanisms increase to £4.9 million p.a. In addition we will spend some £9 million pa on 600 CASE studentships and BBSRC Institutes will receive over £12 million p.a. income from contracts and collaborations with industry;
- 16 university departments substantially funded by BBSRC have spun-out 42 companies;

- particularly successful university spin-outs arising from BBSRC-supported research include Oxford Biomedica (LSE-listed), Inpharmatica, Biotica and NeuroSolutions. The latter company was established following its successful participation in the 2001 Business Plan Competition and is highly successful with extensive contracts with pharmaceutical companies;
- in the period 2000–04, BBSRC institutes won research income exceeding £60 million from industry and £14 million from research charities;
- BBSRC institutes hold 244 patents, have spun-out 13 companies and, since 2001, exploitation income has exceeded £7 million;
- last year BBSRC institutes were involved in 200 industrial consultancies involving some 160 separate companies;
- the Paracox vaccine, developed at BBSRC's Institute of Animal Health to control parasites in poultry, has now yielded over £1 million in royalty income; and
- societal impacts are also evident, ranging from early support for Professor Sir Alec Jeffries at Leicester University, which led on to DNA fingerprinting with its subsequent impact on crime detection, through analysis of the FMD virus which impacted government policy on handling the foot and mouth disease outbreak, to pioneering cloning studies at BBSRC's Roslin Institute, which opens up potentially enormous health benefits through therapeutic applications of stem cells.

BBSRC APPROACH TO PROMOTING COLLABORATION AND KT

5. BBSRC aims to optimise the process through which research leads to benefit for the economy and society providing support mechanisms for BBSRC-funded scientists in both universities or institutes at key stages in the commercialisation process. Our approach is described in subsequent paragraphs under four broad areas: Collaboration in Research; Collaboration in Education and Training; Networking through People and Knowledge Flow; Commercialisation. BBSRC's recent Delivery Plan has set ambitious targets for enhancing activity in these areas where targets for 2007–08 are highlighted in bold in the sections below.

Collaboration in Research

6. In 2003–04 BBSRC supported some £12 million of collaborative research grants, primarily through the LINK mechanism, involving 55 companies. BBSRC plans by 2007–08 to double its support for collaborative R&D, where significant progress is already being made:

- A BBSRC Technology Strategy has been developed, following consultation with industry, identifying eight priority areas where science activity needs to be enhanced to meet industrial need over the next 10 years. We will seek to fund collaborative activity in these priority areas, where progress is already being made in:
- *Integrative Mammalian Biology*: the aim here is to reinvigorate research and training involving the physiology and pharmacology of whole animals. This £12 million initiative is led by BBSRC and co-funded by MRC and industry (£2 million each) and the Funding Councils (£6 million). Applications are currently being assessed;
- *Bioprocessing*: bioindustry can benefit from innovative research into the more effective production and separation of biopharmaceuticals. BBSRC has been in the lead in developing the Bioprocessing Research Industry Club (BRIC) with EPSRC, where eighteen companies are involved contributing £1 million to a £10 million initiative. Calls for proposals were issued in October 2005;
- *Crop Products and Processes*: there is much to be gained from more effective translation of research on model species into crop plants. BBSRC announced a £11 million initiative in this area in September where, to encourage collaboration with industry, and particularly with breeders of wheat, the most important UK crop, a further £1 million is available for research in collaboration with industry.
- BBSRC will work with the DTI in the development of a national Technology Strategy. BBSRC has agreed to partner with DTI in calls for collaborative R&D proposals in Industrial Bioproducts (November 2004), Biopharmaceutical Bioprocessing (April 2005) and Regenerative Medicine (November 2005); and
- There is much benefit in encouraging industry awareness and partnership in responsive mode grants submitted to BBSRC. Therefore we have introduced an Industrial Partnership Award (IPA) scheme, through which all research proposals that have obtained a 10% cash contribution from industry will be funded provided they reach a quality threshold. It is intended that by 2007–08 BBSRC will increase four-fold support for IPAs.

Collaboration in Education and Training

7. At any one time BBSRC supports over 2,000 PhD students, of which some 30% are in collaboration with industry through CASE awards. We recognise that trained manpower moving into industry is a key component of knowledge transfer, where current figures show 21% of BBSRC-funded postgraduates moving into industry immediately upon completion of their PhD. We have responded to industry pressures by:

- enhancing stipends in shortage areas such as *in vivo* physiology;
- introducing an Industrial CASE scheme in which companies apply for the awards. By 2007–08 we plan to increase numbers of Industrial CASE Awards by 30% to 120 awards per annum. We are working with RDAs to enlist their support in bringing opportunities to the attention of SMEs in their area; and
- pump-priming short courses with the aim of providing update training in new and emerging areas for scientists in industry. Over the past three years, 37 modules have been funded and, given the success of the scheme, we are planning to increase funding by 40% to £280,000 per annum by 2007–08.

Networking through People and Knowledge Flow

8. It is frequently said that the best form of knowledge transfer is on the hoof and we are therefore keen to encourage interaction between the science base and industry with a view to creating permeable boundaries that enable the exchange of people and ideas. Particular activities include:

- in the past Faraday Partnerships (FP) have been effective in encouraging dialogue between academic and industrial researchers in particular sectors. For the future DTI is now developing a similar concept of Knowledge Transfer Networks (KTNs). BBSRC is playing an active role in interacting with these and will respond to collaborative research proposals or Industrial CASE projects emerging from these networks; and
- we have supported the movement of scientists between academe and industry, and vice versa, through sponsorship of the Royal Society Industry Fellowships (IF) scheme. However we wish to encourage further interchange to facilitate access to facilities or to acquire new skills, where interchanges of even relatively short duration can be of benefit in meeting strategic needs and providing a base for longer-term partnerships. In September 2005 BBSRC therefore launched an Industry Interchange Programme (IIP) to encourage such strategic partnering. Providing good proposals are forthcoming, we plan to support at least 10 awards by 2007–08.

Commercialisation

9. We have developed a pipeline of activities to support the commercialisation of BBSRC science. We recognise that there are other players in this space, principally university technology transfer offices and RDAs, and look to work with these wherever appropriate. Activities include:

- we are keen to enhance awareness of intellectual property amongst successive generations of BBSRC-supported postgraduate students and postdoctorals. We therefore co-fund, with local technology transfer offices, IP awareness events. In 2003–04 we were involved with 22 such courses in which 890 bioscientists participated. For 2007–08 we plan to sponsor 30 courses reaching 1,200 individuals;
- the Biotechnology Young Entrepreneurs Scheme (YES) is aimed at enhancing the commercial awareness of bioscientists at the postgraduate and postdoctoral level. BBSRC launched this scheme in 1996 and now operate it in conjunction with MRC and NERC. At its tenth anniversary, this scheme has proved highly successful, where a recent review highlighted many examples of the scheme influencing the career paths of participants, including the launching of their own start-up companies. For 2007–08 we intend to expand participation by 20%, reaching out to 180 young bioscientists per annum;
- the aim of the Follow-on Fund is to provide proof-of-concept funding, at around the £60,000 level, to allow the commercial potential of ideas generated through BBSRC grant funding to be further explored. This scheme was launched in 2004 with EPSRC and NERC as partners. In that year we awarded grants of value £600k. We now plan to provide proof-of-concept funding of at least £1 million per annum;
- the Bioscience Business Plan Competition was initiated by BBSRC in 1999 and now is run as a cross-Council competition. BBSRC will continue to support this scheme as long as the need continues;
- we launched an Enterprise Fellowships Scheme in early 2005, in collaboration with the Royal Society of Edinburgh, to provide scientists with a potentially commercialisable idea the time and skills to move forward their idea. In May 2005 we awarded the first four fellowships. We plan to support at least 10 such fellows by 2007–08;

- for many universities access to Seed Funds now exists at a local or regional level. For our own institutes, BBSRC has become a partner of the Rainbow Fund, providing support for up to £250,000 for start-ups arising from our institutes;
- for a fledgling company, the nurturing environment of a bioincubator providing access to skills and facilities can be highly important. Three BBSRC institutes provide bioincubator facilities, where the bioincubator at the Babraham Institute has been particularly successful with eighteen companies on site. Furthermore, a new biodevelopment building, offering grow-on accommodation to expanding bioventures, was opened in 2005 and is now fully occupied; and
- BBSRC has assisted small bioscience companies to expand their research capabilities. Over the past four years 33 SBRI awards have been made to 28 SMEs totalling £6.9 million.

BBSRC INSTITUTES AND KT

10. The role of BBSRC institutes in KT merits further explanation:

- the BBSRC institutes are significant in size with annual revenues ranging from £9–31 million, with BBSRC funding generally below 50%. In line with advice to the Treasury contained in the 1999 Baker Report, BBSRC delegates responsibility for KT management to its institutes. Nevertheless, in order to encourage management of IP on a portfolio basis, BBSRC has invested in an exploitation company, PBL, to handle commercialisation across the four plant and microbial science institutes;
- BBSRC reviews the performance of its institutes through a formal knowledge transfer assessment exercise every four years. In addition progress on KT matters is reported annually to Council and is a fixture of six-monthly “Business Plan” meetings;
- in 2004 OST operated a PSRE Fund through which public sector research establishments were invited to bid for resources to enhance their KT activities. Whilst competition was strong, BBSRC and its institutes were successful in being associated with over 50% by value of projects funded; and
- BBSRC institutes primarily pursue work relevant to agriculture and food where they play a substantial role in the development of evidence-based policy for government departments, particularly Defra and the FSA. In addition, a key part of knowledge transfer activity for these institutes is the work they do to demonstrate and achieve implementation of best practice.

STAKEHOLDER ENGAGEMENT AND COMMUNICATION

11. BBSRC Council and its advisory Boards, Committees and Panels are constituted by individuals from a wide range of backgrounds, with over 20% drawn from user communities, including experts from the pharma, biotech, chemicals, food and agriculture sectors. To help us develop and implement our policy relating to business interaction and knowledge transfer, we are guided by a Bioscience for Industry Panel comprising industrial representatives, KT and finance professionals, together with representation from RDAs and DTI. To improve the quality of our decision making, and to help foster public trust in science outcomes, Council is advised via its Bioscience for Society Panel. This includes social scientists, bioethicists and individuals from a range of NGOs. We use the media, public meetings and exhibitions, publications, and interactions with schools to promote awareness of advances in bioscience and their applications.

12. BBSRC developed its Ten-Year Vision and Strategic Plan through a series of discussions with stakeholders. We routinely use a variety of mechanisms to engage stakeholders with new research opportunities and developments. The outcomes enable scientists and end-users to reflect on, and respond to, public aspirations and concerns that might impact on future commercialisation and uptake of new technologies. Examples of activities include: the UK’s first Consensus Conference, on plant biotechnology, in 1994; and more recently, discussion meetings, consultations and attitude surveys on future directions in crop science, livestock genomics, and research on diet and health. We are also contributing to public engagement on energy research and on nanotechnology.

13. We are in frequent discussions with trade associations such as ABPI, BIA and FDS. BBSRC staff regularly visit companies and contribute to conferences and meetings, including those arranged by CBI.

RESULTS AND PERFORMANCE MANAGEMENT

14. In 2005 BBSRC, together with the other Research Councils, produced a Delivery Plan covering the period to 2007–08. A Performance Management Framework has been agreed with OST, where we report progress against a scorecard on a quarterly basis.

15. Evaluation of the outputs from BBSRC programmes is routine where, for example, for research activity, we have a rolling series of portfolio and initiative reviews ensuring that we are able to benchmark and evaluate not only the scientific output of BBSRC-supported research, but also outputs impinging on society and the economy. We also collect a comprehensive set of exploitation metrics from our institutes and leading university bioscience departments.

16. We regularly review the effectiveness of our KT initiatives, where recent examples include:

- in autumn 2005 we carried out a career tracking study of “graduates” of our Young Entrepreneurs Scheme. This revealed that most had substantially benefited from the training given and where “graduates” were twice as likely to obtain subsequent employment in industry as their peers, with significant numbers either working in SMEs or even starting-up their own companies; and
- a review of the 30 teams benefiting from mentoring in the first two Business Plan Competitions revealed that 10 had gone on to raise, within two years of participation, over £2 million of risk capital.

Annex 3

Council for the Central Laboratory of the Research Councils (CCLRC)

RESEARCH COUNCIL SUPPORT FOR KNOWLEDGE TRANSFER

EXECUTIVE SUMMARY

The CCLRC’s unique scientific heritage, science facilities, underpinning technologies and wide base of academic users provide an exceptional environment for Knowledge Transfer (KT). For the CCLRC, KT encompasses the systems and processes by which knowledge, expertise and skilled people transfer between the CCLRC’s research programmes and industry contributing to the creation of wealth in the UK.

These activities include:

- *Exploitation*: exploiting intellectual property owned by the CCLRC through licensing, spin-out companies or direct sales.
- *Wider access to CCLRC large research facilities*: actively marketing the research capabilities of the CCLRC’s major research facilities to business.
- *Leveraging knowledge through training*: developing a future capability in Education and Training to leverage the potential of CCLRC skills and knowledge for the wider economy.
- *Campus Development*: establishing technologically diverse and vibrant mixed-economy communities obtaining clear commercial advantage from their co-location with the CCLRC.

INTRODUCTION

1. The CCLRC is one of Europe’s largest multidisciplinary research organisations operating the Rutherford Appleton Laboratory (RAL) in Oxfordshire, the Daresbury Laboratory (DL) in Cheshire and the Chilbolton Observatory in Hampshire. The CCLRC manages fundamental research facilities in neutron scattering, high power lasers and synchrotron radiation alongside broad science and technology programmes ranging from space science and high power computing to particle physics and advanced instrumentation. These facilities and programmes are operated on behalf of the UK’s academic community and sister Research Councils (RC). The CCLRC differs significantly from RCs who operate major programmes of research grant funding and postgraduate training.

2. The large facilities operated by the CCLRC are ISIS, the world’s leading pulsed neutron and muon source, the Central Laser Facility, the world’s most intense academic laser facility, and the Synchrotron Radiation Source, a world class facility dedicated to the exploitation of synchrotron radiation for fundamental and applied research. The CCLRC’s core competencies include the engineering and instrumentation programmes that underpin its facilities and research programmes—the CCLRC “makes science happen”.

3. Complementing its in-house capabilities the CCLRC also manages the UK interests in the Institut Laue Langevin and the European Synchrotron Radiation Facility in Grenoble. On behalf of the UK government, the CCLRC is also the main shareholder in *Diamond Light Source Ltd*.

COLLABORATION BETWEEN RESEARCHERS AND PARTNERS IN INDUSTRY, INCLUDING THE CREATIVE INDUSTRIES AND SMEs

4. In 2004–05 the CCLRC collaborated with 1,600 higher education institutes, government research bodies, industries and other organizations. Through these interactions CCLRC knowledge and expertise is transferred through collaborative research, the supply and use of research facilities or services, the co-development of CCLRC facilities or technology, or in the provision of training by CCLRC staff.

The following examples illustrate how the CCLRC's knowledge and expertise is transferred to the private sector.

CCLRC facility access by industry

5. Industrial usage of CCLRC facilities can be direct, through contracted research programmes, or more frequently is indirect through UK academics working on collaborative research programmes with the private sector.

6. An example of this is the usage of the ENGIN-X beamline at ISIS which is a dedicated engineering facility optimized for engineering strain and stress measurements in engineering components such as turbine blades. Around 50% of the facility time on ENGIN-X is used for industrial applications. Experimental collaboration involving Rolls Royce, the University of Manchester and Imperial College has resulted in neutron strain scanning forming an integral part of the research programmes that underpin product development at Rolls Royce.

7. Commercial access to the SRS and other materials characterisation services at the Daresbury Laboratory are facilitated by Daresbury Analytical Research Technology Services (DARTS). Through DARTS, industry can apply the unique capabilities of synchrotron radiation, and the skills of Daresbury's research scientists, to research problems in a timely, cost-effective way. The SRS has worked for 22 private sector customers in the last two years, predominantly from the pharmaceutical sector—for example AstraZeneca, GlaxoSmithKline, Avidex Ltd and Vertex Pharmaceuticals Ltd. The most popular services have been protein crystallography and nanoparticle size distribution measurements using small angle scattering.

Examples of departmental collaborations with industry

8. The CCLRC's Science and Engineering departments also have strong links to industry. The Space Science and Technology Department (SSTD) has 80 contracts running with industry, to the value of around £6 million this financial year. This includes substantial contracts to supply instrumentation for satellites into industry, a leading example being a multi-£M contract from Lockheed for a NASA satellite. The SSTD has also provided novel space camera technology for the TopSat spacecraft designed to demonstrate the capabilities of small satellites for high value remote sensing missions. Built by *Surrey Satellite Technology Ltd*, the mission is managed by *QinetiQ Ltd* using £12 million of funding from the British National Space Centre and Ministry of Defence. In addition, the CCLRC provides telemetry for the GIOVE-A mission, a pilot satellite for the Galileo project, again built by *Surrey Satellite Technology Ltd*.

9. The Computational Science and Engineering Department (CSED) are developing their commercial interests with the establishment of Daresbury Analytical Computing Services (DAComS) the commercial brand through which it promotes the commercial exploitation of CSED facilities and software. Current examples of commercial interactions include partnership with Intel to benchmark their processors on a broad spectrum of scientific applications and with AMD to explore life science applications of their hardware. Most recently the CSED have partnered AstraZeneca in a £300K three year contract to undertake high performance computing simulations for drug formulation.

Commercialisation

10. Central Laboratory Innovation and Knowledge Transfer (CLIK) Ltd, was established in 2002 to professionally manage the commercialisation of CCLRC Intellectual Property. To date CLIK has established six spin-out companies in a wide range of market sectors including medical diagnostics and industrial sensors. These companies have already attracted approximately £6 million in external investment and currently employ 30 people. ThruVision, a recent spin-out company from the SSTD, is aiming to become the leading commercial provider of compact security screening equipment using terahertz imaging technology and is generating substantial commercial interest with a range of security products. Thruvision won the 2003–04 RCUK Business Plan Competition.

Collaboration with the creative sector

11. The 2 million Euro "Ancient Charm" project supports scientists to develop new or combine existing research techniques to investigate objects of cultural heritage. In this project, ISIS has been used to generate 3D graphic animations of bronze statues using neutron tomography. Other projects include authenticity investigations of archaeological artefacts using CCLRC facilities (ISIS and Synchrotron Radiation Source) to non-destructively analyse archaeological objects to understand manufacturing techniques, assess authenticity and develop conservation techniques.

Collaboration with SMEs

12. The CCLRC has strong links with UK high technology SMEs in the product areas relevant to its technology needs. Key examples include magnet design and construction (Tesla Engineering Ltd), solid state imaging detectors (e2v, Applied Microengineering Ltd), extreme sample environments, (Oxford Instruments), satellite technology (Surrey Satellites Ltd), micro and nano fabrication (Xfab, Nanosight Ltd), and micro electronics fabrication.

13. The CCLRC maintains strong links with companies that have spun out of its technology programmes for example Qudos and Oxsensis. Where such companies have strong synergies with CCLRC technology, they co-locate onto CCLRC laboratory sites; four are currently co-located.

STAKEHOLDER ENGAGEMENT AND COMMUNICATION

14. The CCLRC sits at the centre of a complex matrix of stakeholders that includes academia, the private sector, regional and local government and other RCs. The following examples illustrate how the CCLRC has engaged with this diverse set of stakeholders.

Private sector engagement

15. The CCLRC hosts industry days to engage with those industry sectors that can utilise large facilities within their R&D programmes or supply the high technology components required for large facilities.

16. Certain industry days are clearly associated with major procurement programmes for CCLRC facilities. Recent examples include industry days for 4GLS (a next generation high intensity light source) in 2004, ISIS Target Station two and the Diamond Light Source in 2005. The 4GLS industry event, organised and sponsored by the North West Development Agency (NWDA), attracted over 94 delegates representing 33 firms interested in the advanced technology required to construct and the scientific exploitation of 4GLS. In 2005, 100 visitors from a broad range of industrial sectors attended the Diamond Light Source open day to understand the facility and its potential to support private sector R&D.

Regional and local government engagement—Campus development projects

17. Over £50 million has been invested in the Daresbury International Science and Technology Park by the NWDA creating over 24,000 sq ft of laboratory. To date 17 high technology companies, with strong synergies to the Daresbury science base, have been attracted to the site with an additional four already planned. At the RAL, the Minister for Science has confirmed that the Harwell site will also be developed into an “International Science and Technology Campus”.

18. Proximity to CCLRC research facilities at the DL and RAL, for academia in “research hotels” or the private sector through campuses, are established routes to foster collaboration and innovation. The CCLRC campus programmes for these laboratories will be developed coherently and used as models of excellence for innovation and public sector KT with the RDAs.

Academic engagement

19. The CCLRC has an active Education and Training programme in which it engages with academia. The CCLRC is an active partner in a local Centre of Vocational Excellence. In addition, the CCLRC acts as an industrial partner in the Cooperative Awards in Science and Engineering studentship scheme. A pilot “Graduate School” to provide opportunities for research students and participants from industry to attend work placements at CCLRC research facilities is currently being established.

20. CCLRC departments engage extensively in the provision of training courses, summer schools, visiting lecture programmes and seminars in their specialist areas. The CCLRC collaborated in training provisions with 92 different Universities during 2004–05, for example around 25 SSTD staff regularly lecture in HEIs.

RESULTS AND PERFORMANCE MANAGEMENT

21. The CCLRC, distinct within the RCs in its focus on facility operation rather than grant funding and training, has a unique role to play in delivering wider economic value from the science budget. The contribution of the CCLRC to delivering the KT agenda is broad encompassing its ambitions in training, commercialisation, facility utilisation and campus development. The results of this programme will be assessed through a combination of the metrics established as part of the OST RC performance management framework and case studies.

22. The metrics that the CCLRC has established in the output two metrics framework—"Better Exploitation", as follows:

<i>Interaction with business and public services</i>	<i>03/04</i>	<i>04/05</i>	<i>05/06 to date</i>
% of major CCLRC facility "beam-time" employed by private sector directly	1% ISIS 3% CLF 6% SRS	1% ISIS 1% SRS	1% ISIS 1% SRS
Number and income from direct private sector users of CCLRC facilities.	132 £1.1M	204 £1.0M	232 + £1.0M +
% of major CCLRC facility "beam-time" employed by academic/private sector collaborations	Information not historically collected, new data gathering scheme in place with first results expected in Summer 06.		
Number of academic/private sector collaborations using CCLRC facilities			
Number of private sector businesses co-located on CCLRC campuses	NA	NA	21
Number of co-authored publications arising from academic institution/private sector collaboration using CCLRC facilities	45	80	65
Turnover and employee numbers for co-located private sector companies on CCLRC campuses	NA	NA	£2.5M plus significant V.C. investment 52 staff
<i>Collaborative research</i>			
Number and value of collaborative private and public sector technology development projects	50 £2.54M	45 £2.45M	100 £6.35M
<i>Commercialisation of research</i>			
Number of start up companies established per year	3	3	1
Number of patent filings per year	10	14	6
Commercial income (revenue/turnover) of start up companies	0	£550K	Awaiting annual accounts
Income arising from licensing and royalty based agreements per year	£40K	£48K	£34K
<i>Cooperative training</i>			
No. of CCLRC sponsored CASE award students	Unknown	15	12

KT expenditure

23. For clearly defined KT programmes the following table presents an assessment of CCLRC's KT expenditure. Not included in this assessment are the intangible costs associated with the activities of the CCLRC's programmes and staff that contribute to KT, for example, presentation at conferences, informal discussion with facility users, co-authorship of papers etc. Such contributions to the CCLRC's KT are believed to be significant and may represent up to 10% of staff time.

	<i>CCLRC financial support for KT programmes/activities</i>			<i>Direct KT staff time</i>		
	<i>£K</i>			<i>FTE</i>		
	<i>2003/04</i>	<i>2004/05</i>	<i>2005/06</i>	<i>2003/04</i>	<i>2004/05</i>	<i>2005/06</i>
Total	2,000	2,000	2,300	20	19	22

Co-ordination between the Councils and the role of RCUK

24. The CCLRC's facilities and programmes are operated on behalf of the UK's academic community and Research Councils. Approximately 30% of the CCLRC's annual income of £155 million is funded by PPARC, EPSRC, NERC, BBSRC and the MRC. Service Level Agreements cover the main programmes commissioned by these Councils. The history of the CCLRC as the central laboratory for the RC positions the CCLRC as a key partner to collaborate with the RCs in their programmes.

Examples of collaborative KT programmes with the other RCs include—

25. The CCLRC and EPSRC are working together on several High Performance Computing projects using HPCx. In collaboration with the U.S. National Science Foundation, Grids from the UK and USA were linked and supercomputing systems were simultaneously used to carry out interactive simulations, for example, on DNA modelling.

26. A collaboration including the CCLRC, the *AHRC Research Centre for Studies in Intellectual Property and Technology Law* and other University groups has established the Digital Curation Centre to address challenges of digital preservation and provide research, advice and support services to UK institutions. Part funded by EPSRC, the Digital Curation Centre will provide a national focus for R&D into curation issues and promote expertise in the management of all research outputs in digital format.

27. The CCLRC established, in 2003, the £1 million Technology Partnerships Programme with SR02 funding to participate in the cross-Council programmes on Stem Cells, Brain Science, and Post Genomics and Proteomics. In collaboration with leading medical or biological specialists this funding facilitates the transfer of CCLRC micro fabrication, detector and micro-electronics technologies to these disciplines.

Annex 4

Engineering and Physical Sciences Research Council (EPSRC)

RESEARCH COUNCIL SUPPORT FOR KNOWLEDGE TRANSFER

INTRODUCTION AND BACKGROUND

1. The EPSRC's 10 year vision for Knowledge Transfer is "that the UK should be as equally renowned for knowledge transfer and innovation as it is for research discovery". This vision clearly matches the Government's long-term strategy for improving the UK economy through investing more strongly in its knowledge base and translating this knowledge more successfully into innovation, as set out in the Science and Innovation Investment Framework (July 04).

2. EPSRC encourages industrial collaboration in all the activities it supports. Current expenditure promoting Knowledge Transfer is estimated to be 40% of the total budget. This amounted to approx. £200 million in 2004–05, broken down broadly into collaborative research (£132 million), collaborative training at postgraduate level (£61 million), and other activities (£1 million). This level of expenditure is expected to continue over the current spending review until 2007–08. For the years 2006–07 and 2007–08, EPSRC has been allocated an additional £2.968 million from the OST Knowledge Transfer (KT) Fund which will be used to support specific activities to promote better exploitation across the EPSRC portfolio.

3. Almost all aspects of EPSRC business have a Knowledge Transfer (KT) aspect, thus most staff play a role. The Director of the Research and Innovation Directorate holds prime responsibility for KT activities across EPSRC. Teams and groups have specific responsibilities for internal and external facing roles, including membership of appropriate bodies of Research Councils UK (RCUK), such as the Knowledge Transfer Group (KTG) and Research Directors Group (RDG).

4. In consultation with our relevant strategic advisory bodies and key stakeholders, we have reviewed and confirmed the role which EPSRC should play within pathways to better exploitation. This can be summarised as:

- A primary role in enabling the generation of Intellectual Property (new knowledge) in areas of national importance;
- A significant role in Knowledge Transfer and encouraging enhanced levels of business-university interaction (principally in partnership with third parties);
- A lesser role in the actual exploitation and commercialisation (ie revenue generation) of research into new products, processes, systems and services.

5. The global environment for the science base and business is becoming increasingly competitive and dynamic. The UK must retain its core strengths and values to remain attractive as a place to undertake research and innovation. Key to achieving this will be the development of a strong shared vision with business and other collaborating sponsors and partners. We are also aware that many universities are currently re-structuring in response to this changing situation and the recognition that companies will increasingly source knowledge which offers the best return on a global basis. Against this background, the key challenges for EPSRC are:

- To maintain current levels of collaboration whilst also promoting better quality interactions between business and academia;
 - To strengthen our engagement with business and reach out to a broader cross-section of companies. This should result in increased business awareness and visibility for the activities that EPSRC supports;
 - To stimulate enhanced user demand for research and subsequent pull-through of research into business.
6. The ways in which EPSRC addresses these challenges are set out in the following sections.

PROMOTING COLLABORATION BETWEEN INDUSTRY AND ACADEMIA

7. Many interactions between business and universities funded by EPSRC have their origins in “point to point” contacts between individual researchers and their colleagues in companies, often SMEs, in which we have had no direct involvement. Our role here is, nevertheless, to foster and maintain an environment in which such collaborations are valued and supported. We also recognise the need to work with intermediary organisations, such as RDAs, DAs, Faraday Partnerships, who are able to reach companies that we are unable to reach alone, and are pro-active in promoting collaboration through a range of instruments as set out below.

Collaborative Research

8. EPSRC funds collaborative research through both responsive mode and targeted strategic funding, where user collaboration is often mandatory. Since 1994, the level of such collaborative activity has increased 3-fold and currently stands at 43% (2004–05 spend). Examples of collaborative research supported:

- Innovative Manufacturing Research Centres (IMRCs): There are 17 IMRCs representing an EPSRC investment of £80 million. IMRCs are expected to attract matched funding (mostly in kind) from industry partners. The IMRCs currently collaborate with over 1,000 companies, many of them SMEs. A recent review found a high level of satisfaction for the IMRCs amongst industrial collaborators, primarily because the significant levels of long-term funding enable the development of more strategic relationships and plans, and allow the IMRCs to respond quickly to business needs.

A software package developed at one of the IMRCs is being used as a graphical tool to help designers work logically through their designs and provide a simple means for them to record their rationale. It has now been incorporated into the standard Product Lifecycle management tool set of a leading global engineering company.

- The National Technology Programme: EPSRC is a key funding partner in the Technology Programme and has been working with DTI on this activity since April 2004. EPSRC plans to commit up to £10 million pa from 2005–06 to the academic component of successful science to business projects. To date, we have committed approx £8.5 million funding towards 17 projects.
- Interdisciplinary Research Collaborations (IRC): These large scale activities involve consortia of academics from different disciplines and institutions in order to create a critical mass of expertise able to work together to meet a common challenge.
- The EQUATOR IRC involves eight universities and the Royal College of Art in investigations of technical innovation in digital and physical life. The consortium has worked in collaboration with a number of small and large companies within the creative industries to develop innovative approaches and products, which are being widely adopted.

9. We recognise the need to respond and adapt funding models to the needs of different sectors and research communities. The following activities demonstrate new, flexible approaches:

- Design in Technology Research: A pilot scheme funded by EPSRC and the Design Council to support interaction between designers and Engineering Advanced Fellows. The scheme demonstrated how the involvement of designers in the early stages of technology development can speed up the translation of technology to the market-place. Six 3-month projects looking at highly innovative and promising technologies were supported.
- The Ideas Factory: This approach brings together multidisciplinary teams of researchers and users for a week long “Sand-pit” to address significant business or societal challenges. Topics have included maintenance and renewal of the buried infrastructure, gun crime, closing the productivity gap and bridging the digital divide. Successful collaborative ideas that emerge from the sand-pits draw down from an earmarked sum of £1 million.

Collaboration in Postgraduate Training

10. We engage with universities, employers and other stakeholders in order to understand issues from the supply and demand sides of postgraduate training. We specifically encourage the development and supervision of post-graduate training within a business environment. Our aim is to help create a national workforce within the engineering and physical sciences to drive discovery and innovation and make the UK an attractive, and competitive, knowledge and skills hub within the global economy.

Key features of our 10 year postgraduate training strategy include:

- Attracting sufficient numbers of high quality students into postgraduate training in EPS in order to increase the attractiveness of research careers in the UK;
- Making postgraduate training more demand led and responsive to user needs.

11. Current support for collaborative training is approx. £60 million pa, largely provided through Collaborative Training Accounts (CTAs). CTAs are distributed to selected universities and account for about 40% of overall training provision. CTAs offer substantial guaranteed funding to universities and encompass all EPSRC schemes that link training to the workplace. The CTA mechanism offers great flexibility allowing research organisations to respond dynamically to the changing needs of industry.

CTAs provide businesses with:

- Clear visibility of the skills training on offer (especially for existing employees to re-enter education at masters or doctoral level);
- Single-point entry into individual universities;
- The option of different length relationships;
- The ability to leverage their financial input with that of other public (including RDAs/DAs) and private sector sponsors.
- The CTA mechanism will be reviewed in 2007. Key aspects of the review will include:
- The extent to which individual CTAs have fostered appropriate people flow in response to user needs;
- Adoption of best practice approaches to working with business.

A student from Newcastle University went on a Research Assistant Industrial Secondment to an innovative company that supplies films for speciality packaging, labelling, graphic arts and industrial products to apply a statistical approach to its polypropylene film production process. This process is now being managed more effectively with additional improvements in quality and productivity. He has subsequently been taken on by the company.

12. Examples of industrial collaboration on training:

- **Industrial CASE:** Industrial CASE is a three and a half year postgraduate award where the research is driven by the industrial collaborators. Most Industrial CASE studentships are supported through CTAs, but in addition to this companies are now able to bid into a pool of studentships. This is operated on a competitive basis with a particular focus on innovative SMEs. The aim of the pool is to open the scheme up to a much wider range of companies and provide a greater degree of flexibility in the use of the awards. Intermediary organisations (eg RDAs, DAs, and Faraday Partnerships) are encouraged to promote the opportunity locally in order to reach companies not previously known to EPSRC.
- **Engineering Doctorate (EngD):** The EngD is a work-based alternative to the traditional PhD, where students (known as research engineers) spend around three-quarters of their time working with their collaborating company. Industry partners have a key role in designing projects undertaken, in sponsorship and joint supervision.

People and Knowledge Flow

13. EPSRC believes that one of the most effective forms of KT occurs through people movement.

- **Postgraduates:** About one-third of all EPSRC research students' projects involve formal collaboration with industry. Around 50% of all EPSRC supported PhD students, and about 30% of research assistants enter the private, government and other public sectors. We are currently working with a number of Professional Institutions to improve our understanding of career paths and impact. CTAs enable postdoctoral research assistants to spend up to one year within their collaborating companies to embed the skills, knowledge and technology developed through the project within the company.
- **Fellowships:** The Industry Fellowships Scheme, administered through The Royal Society, provides good opportunities for two-way people flow between industry and academia. Of the 31 Industry Fellows in post over the past four years, 25 have been within EPSRC's remit. 19 of the Fellows moved from academia into industry, with the other 12 from industry to academia for their Fellowship. We will be increasing our annual contributions to the scheme from £200k pa to

£250K pa from 1 April 2006 to 31 March 2009. We also co-fund a number of Post-Doctoral Research Fellowships with the Royal Academy of Engineering, to enable high quality engineers to quickly establish research careers.

A Professor from Newcastle University undertook a three year part-time Industry Fellowship with a leading microchip manufacturing company, where he was able to access a wider range of resources and equipment not available at the university. The experience has provided new technology for the company and further collaborative research projects between the university and the company funded by EPSRC.

Commercialisation

14. For the research and training activities we support, responsibility for Intellectual Property (IP) is delegated to the funded university. We expect universities to have suitable mechanisms in place to ensure appropriate exploitation and take-up of potentially commercial outcomes.

- Start-ups: A previous survey showed that some 500 start-up companies had been formed in the past decade that built on previous EPSRC funded research. Another survey, by the Royal Society of Chemistry, reported that 85% of spin-out companies from chemistry departments were based on technology arising from EPSRC-funded research.

Novel research at Cambridge on molecular materials for possible use as good semiconductor devices has led to the development of two highly successful spin out companies, Cambridge Display technology and Plastic Logic. The research group (under Professor Sir Richard Friend) has also received world recognition of pushing science boundaries through a review of their research in “Nature” (March 2005). Various independent studies have predicted a potential market size for flexible displays of \$10-20 billion by ca 2010.

- IP training: We run (currently through Oxford Innovation) training courses on Intellectual Property for new academics and research fellows. Industrialists play a key role and are invited to present case studies.
- Integrated Knowledge Centres (IKCs): We plan to support two pilot “Integrated Knowledge Centres” (IKC) in 06/07 and 07/08. IKCs will:
 - combine world class research with strong partnerships with business;
 - be established in areas where the research field is emergent and there are business with the capability to exploit the resultant knowledge-base to create new market opportunities;
 - provide a university campus-based environment to support the full, complex and multi-dimensional KT process;
 - have considerable flexibility to develop an effective KT programme matched to the needs of business.

IKCs will engage in generating IP, Knowledge Transfer and exploitation and, for the first time, our support will provide some funding towards the costs of management of collaborative, entrepreneurial and commercial services. EPSRC funding of £7m over 5 years will be provided for each pilot. IKC teams will be expected to secure additional funding from business and the RDAs/DAs are likely to play a significant role.

- Funding for commercialisation is also available through the RCUK Follow-on Fund and Business Plan competitions in which we take an active part.

STAKEHOLDER ENGAGEMENT AND COMMUNICATION

15. EPSRC engages with business in a variety of ways, many of which interplay with each other in order to build up a rich set of interactions. We see opportunity to increase such interactions across most of our operations, and to increase the quality of those where the greatest benefits are likely to be. Some examples of the types of current interactions with business and other stakeholders are:

- Policy making: Business is well represented on the EPSRC Council, and its two advisory bodies, the Technical Opportunities Panel and the User Panel (UP). The membership of UP is almost entirely from business.
- Strategic Advisory Teams (SATs): SATs provide EPSRC programmes with advice on research and training and 30% of all SAT members are from industry. We recognise the major importance of taking account of public opinion in policy and strategy development. In light of this a new Societal Issues Panel will be established in 2006.
- Peer Review: About 20% of the current EPSRC College (2003–05) is made up of non-academics, 50% of whom (360 in total) are from business. Individuals from business also make up about 10% of the members of peer review assessment panels.

16. EPSRC plays a proactive role in raising the appetite of business for interactions with the science base. Examples of how we are doing this:

- Sector Work: This important EPSRC activity involves 14 sector teams, comprising some 60 members of staff. The key aims of sector work are to:

- increase involvement of all users in EPSRCs longer-term strategic thinking;
- develop strategic partnerships between EPSRC and users;
- increase the general awareness of EPSRC amongst the user community through wider communication and consultation;
- stimulate academic-user collaboration on research grants and training awards;
- increase exploitation of research and training outcomes and knowledge transfer;
- build and sustain a better knowledge and understanding of user needs within EPSRC.

Sector team members have undertaken a variety of “company placements” with eg Thames Water, Smith and Nephew, IBM, Rolls Royce, GSK, BNFL and Scottish Enterprise. Sector teams also visit individual companies to raise their level of engagement both with EPSRC and the academic base.

The Software, Media and Communications Sector represents a significant part of our interactions with the businesses in the creative industries, such as graphic design, computer games, music technology, broadcasting and publishing.

- **Company Account Managers:** To improve the EPSRC/industry interface we will assign company account managers to key companies that are keen to work with us.
- **Technology priorities:** Recently, we developed a set of sector relevant technology priorities as an initial step towards producing a technology strategy. The technology strategy will provide a framework for setting priorities, improve the effectiveness of business-university research collaboration and optimise our alignment with the national Technology Programme and other partners and sponsors.
- **Strategic Alliances:** We have developed a number of strategic alliances with companies to develop better shared understanding and greater levels of engagement. By October 2005, EPSRC had 32 strategic alliances, some of which developed further into formal funding partnerships, including strategic funding partnerships with leading companies. We have also co-funded with industry a number of “star recruits” in areas of identified business or societal need where there is a current lack of expertise within the UK academic base.

The virtual centre of excellence in Non-Destructive Evaluation (established in April 2003) is a strategic partnership between EPSRC and a consortium of companies. The centre has a core research element of £1.5 million EPSRC funding for blue skies research and a further £6 million over five years, of joint EPSRC/industry funding for more strategic research.

Recent examples of “star recruits” include Chairs in: “Castings research” (Rolls Royce—Birmingham University); “Flight deck operation” (Civil Aviation Authority—Cranfield University); and “Knowledge transfer” (Qinetiq—Imperial College).

17. EPSRC staff actively participate in relevant industry bodies such as DTI Innovation and Growth Teams, Leadership Councils, National Advisory Committees for Aerospace and Defence, Committees of the Professional Institutions and other organisations, such as ICARG of the CBI, and also RDA Science-Industry Councils.

18. The EPSRC website hosts a “Grants on the Web” facility that allows anyone with access to the web to find information on the research supported, classified by research topic, organisation, programme, industrial sector or free text search. A number of publications; “Newline”, “Spotlight” and “Connect” provide the external community with regular progress updates on funding opportunities, policy directions, and case studies of the outcomes and impacts of successful research and training activities.

RESULTS AND PERFORMANCE MANAGEMENT

19. We have developed an internal performance and risk management system using a balanced scorecard approach. The scorecard contains all of the key performance indicators for EPSRC, including those for knowledge transfer, and integrates them with the council’s strategies, risks and information on the resources available to deliver. It is planned that the system will become operational from 1 April 06.

20. As part of the performance and risk management system we have established a set of performance metrics to monitor progress against the PSA Output 2 target “Better Exploitation”. These were agreed with the RCUK Knowledge Transfer Group and approved by OST. The broad headings against which performance will be measured are:

- Interaction with business and public services;
- Collaborative Research;
- Commercialisation of Research;
- Cooperative Training;
- People Exchanges between the Science and Engineering Base and Users.

Both the scale of the activity and quality of the activity will be measured by the indicators used. As well as monitoring current activities, the downstream outputs and impacts of our investments will also be monitored and assessed.

21. Examples of how EPSRC is monitoring the success of its investments:

- Collaborator Survey: It is important that we understand the value that companies get from collaborating on research and training activities. We are currently developing plans for a pilot survey to engage directly with industry partners to gauge levels of collaborator satisfaction on the research grants that we support.
- Timeline Case Studies: Timeline case studies are being developed looking at how the outputs of previously funded EPSRC research have been taken-up into industry. This will help towards providing a qualitative measure of value for money of the research supported.

SUMMARY

22. EPSRC has a strong and multifaceted Knowledge Transfer portfolio. The levels of engagement and partnership with business and other partners is high and significant, and in some cases particularly deep through formalised strategic alliances and funding partnerships. The current Delivery Plan 2005–06 to 2007–08, maintains our commitment to a strong and vibrant Knowledge Transfer activity, responsive to the needs to business and society in helping to create the conditions for improving prosperity and quality of life in the UK.

Annex 5

Economic and Social Research Council (ESRC)

RESEARCH COUNCIL SUPPORT FOR KNOWLEDGE TRANSFER

EXECUTIVE SUMMARY

1. This paper explains the mission of the Economic and Social Research Council (ESRC), its strategic drivers, and the contribution that Knowledge Transfer makes to achieving the organisation's mission.
2. A brief explanation is given of the establishment of the small Knowledge Transfer Team following an internal reorganisation; its staffing complement; and the resources it has been allocated.
3. The achievements of Knowledge Transfer are reported in the context of the organisation's Knowledge Transfer Strategy that was approved in April 2004. The strategic actions which have yielded many positive outcomes since that date will be developed and expanded, particularly after additional OST funding becomes available from 1 April 2006.
4. Plans for the future are succinctly summarised using the five headings shared by all Research Councils in the Output 2 framework.

ORGANISATIONAL CONTEXT

5. The ESRC's mission is to:
 - Promote and support, by any means, high quality basic, strategic and applied research and related postgraduate training in the social sciences.
 - Advance knowledge and provide trained social scientists who meet the needs of users and beneficiaries, thereby contributing to the economic competitiveness of the United Kingdom, the effectiveness of public services and policy, and the quality of life.
 - Provide advice on, and disseminate knowledge and promote public understanding of, the social sciences.
6. The ESRC conducted a major national consultation in 2004, within and beyond the social science community. This activity followed the appointment of a new Chief Executive, Professor Ian Diamond, and a significant internal reorganisation.
7. At that time the ESRC adopted four key drivers that influence the way it operates: Research; Capacity; Engagement; and Performance. Of these, Engagement is the most relevant to Knowledge Transfer as it "emphasises the importance of promoting social science and engaging in dialogue with stakeholders to apply research to policy and practice and increase its relevance to potential users".
8. Drawing on last year's consultation, the ESRC has prepared a strategic plan in which one of its strategic objectives is "to engage with stakeholders by a full range of knowledge transfer and communication activities". The plan identifies strategies and sets out goals that will be achieved by 2010.
9. The implementation of the ESRC's Knowledge Transfer Strategy will contribute significantly to the achievements of those goals.

KNOWLEDGE TRANSFER: STAFFING AND RESOURCES

10. The Knowledge Transfer Team was a new entity created in the 2003 re-organisation, although it did not become operative as a unit until 26 January 2004. The team is located within the Communications and Information Directorate, alongside and interacting with the Communications, Evaluation and E-Business teams.

11. There are 4.8 FTE staff (of whom 3.6 are policy managers, and 1.2 support personnel). The Team also supports a 0.5 Research Co-ordinator on behalf of the Local Authority Research Council Initiative (LARCI) which provides policy and practice relevant research from most Research Councils for application in over 400 local authorities.

12. Two further staff will be added from 1 April 2006.

13. In 2004–05 the Team's budget for knowledge transfer activities was £300,000. This was increased to £620,000 in 2005–06. In addition, the ESRC made a contribution of £15,000 to LARCI in both years.

14. Media and public relations, some events, some publications and the interactive portal are funded separately. In addition, the ESRC's centres and programmes as well as grant holders have a small percentage of their budget for communications, dissemination and knowledge transfer activities. It is estimated that £1.5 million would be spent annually in this way.

15. It is also recognised that the teaching function carried out by academics is an important means of knowledge transfer, although it is not a focus of this paper.

16. All studentships have a knowledge transfer function, but there are several schemes where this is particularly emphasised. The ESRC currently allocates £2.7 million to CASE, and £831,000 to Knowledge Transfer Partnerships. £25,000 is allocated to the Business Plan Competition and a similar amount for students who spend three months during their doctorates in a placement scheme operated in conjunction with the Parliamentary Office of Science and Technology.

17. From 1 April 2006, the ESRC will receive about £147,000 for each of two years from the Research Council—Regional Development Agency Capacity Fund; and a total of £1.244 million for the same period from the OST allocation.

IMPLEMENTING THE ESRC'S KNOWLEDGE TRANSFER STRATEGY

18. This section of the paper explains the context in which the strategy was developed; its rationale; its implementation; and achievements. It will evolve in response to changing circumstances' but has an evidence base through stakeholder consultation and engagement.

BACKGROUND

19. The ESRC has been influenced by several key reports:

- Lambert Report on "business-university collaboration"
- Innovation Report on "Competing in the Global Economy".
- Government's "Science and innovation investment framework 2004–14"

20. ESRC accepts the imperatives for Research Councils set out in these reports to increase:

- Rate of knowledge transfer
- Interaction with business
- Amount of collaborative research
- The ESRC's stakeholder engagement consultations and surveys.

DEFINITION

21. For the ESRC we regard knowledge transfer "as involving processes of translation and transformation where there is an interdependence between knowledge and practice (including but not limited to business processes, technological development, policy development and implementation, and the delivery of services) that occur in organisational and institutional settings in which social networks are important".

22. Consequently the ESRC places an emphasis on facilitating and mediating processes that allow new knowledge to be generated, interpreted and utilised in a range of social and economic settings.

THE ESRC KNOWLEDGE TRANSFER STRATEGY

23. Following consultation, the ESRC's Knowledge Transfer Strategy was approved by Council in April 2004. The full document sets out: Context; Definition; Vision; Values; Mission Statement; Strategic Delivery Actions; Specific Actions; and Challenges.

24. In this paper the focus is on the achievement of the Strategic Delivery Actions, each of which is considered in turn.

ENGAGING ACTIVELY WITH ESRC'S KEY STAKEHOLDERS

25. **Rationale:** Our stakeholders form vital strategic alliances with the ESRC as generators, interpreters, consumers, disseminators, funders or stimuli of new knowledge through research and its application. Our stakeholders include those in the public, private, community and voluntary sectors as well as those in academic institutions.

26. **Achievements:** We have transformed informal links with several Government departments into strategic partnerships with 10 Government departments; all three devolved administrations in Northern Ireland, Scotland and Wales; and the National Council for Voluntary Organisations (NCVO).

27. Formalised annual meetings are held at which each partner's organisational context is reviewed; relevant research identified and foreshadowed; past agreed actions reviewed; and future collaborative actions identified. Ongoing dialogue is maintained.

28. Outcomes include:

- Jointly-funded studentships
- Public policy seminars (for which the Government agency is invited to identify a topical policy which is addressed at a seminar by selected researchers and a publication prepared by a science writer).

29. Topics have included: School leaving age influences; Road Pricing; Obesity; Demographic changes in Scotland; Productivity; Corporate governance; Poverty and income distribution in Northern Ireland:

- Joint research
- Research methods workshop
- Research brokering to identify expertise
- Invitations to events
- Distribution of research findings

30. We have engaged with the business sector by:

- contributing to the research council—CBI led consortium—ICARG
- sponsored students on knowledge transfer schemes to work on projects in business or undertake research in these organisations
- engaged in bi-lateral discussions with several large corporations to identify and apply research that is relevant
- sponsored seminars and workshops for business sectors eg insurance; financial services; health; banking
- organised seminars on economic trends or work futures that provide a context in which businesses operate
- held discussions with businesses on dataset and other research resource requirements

31. We have strengthened relations with regional authorities by:

- Co-organising a national conference on "Regional Policy" with the Association of Regional Observatories
- Co-organising a national conference on "Skills" with the ARO
- Organised a seminar on "Regional Funding" that drew on Treasury and DTI input
- Contributing directly to events organised by RDAs

32. We have provided the support and base for the establishment of a 0.5 Research Coordinator who draws on the resources of most Research Councils to respond to the policy needs of local authorities through LARCI for which the principal sponsors are the ESRC and the Local Government Association. Four seminars have been held, including Transport, Ageing, and Education, a quarterly newsletter produced, and a website managed as well as providing a brokering service for local authorities.

33. We have signed a formal concordat agreement with NCVO as a key umbrella organisation for community and voluntary organisations. A new research programme has been launched, Non-Governmental Public Action, and award holders introduced to how to engage in knowledge transfer activities. A public policy seminar was held at NCVO on "Charitable Giving and Donor Motivation".

34. In addition to the ESRC's consultation survey among its stakeholders which argued for more responsive mode funding and greater user engagement, the Knowledge Transfer and Communications Teams combined to conduct a survey among stakeholders that asked them their perceptions of the services provided. The findings of this survey have generated a management plan for future engagement activities.

MANAGING KNOWLEDGE TRANSFER SCHEMES

35. Rationale: These schemes make a significant contribution to three key elements of ESRC's Strategic Framework—they generate new research, they help build capacity and they epitomise engagement as they prompt interaction among multiple institutions.

36. We have actively promoted these schemes. For example, by initiating a publicity campaign applications for CASE awards increased by over 50% and the number of awardees increased from 70 to 85 in 2005. For example, the number of Knowledge Transfer Partnership applications exceeds the funding available.

37. We contribute actively to the Knowledge Transfer Partnerships Management Board and have used this setting to develop co-sponsored arrangements to increase the number of Associates in social science activities. ESRC served on the judging panel for the KTP annual awards.

38. We have contributed staffing and financial resources to the cross-Research Council Business Plan Competition.

ORGANISING KNOWLEDGE TRANSFER EVENTS AND PROCESSES

39. Rationale: To respond to the reality that people learn in different formats and at varying stages, we organise a variety of processes and activities that facilitate interactions between researchers, practitioners; policy makers and other users.

40. We have organised public policy seminars, conferences, workshops, colloquia—In addition to those identified in the section on “Engaging with stakeholders”, “Making the Connections: Governing in Partnership for Sustainable Communities—Wales Approach to Public Sector Reform”; and “The Commission for Africa and the G8: Towards a New Policy for Tertiary Education and Capacity Development in Africa.”

41. ESRC has established an interactive portal that allows those who use it to access a wide variety of research findings, identify expertise, and engage in discussions on-line.

42. We co-sponsored and helped organise a national conference on “Social Policy and Social Care” that drew international and UK researchers, policy makers, and practitioners from diverse social care settings.

43. We collaborated with the Communications Team to organise and then assess the effectiveness of Social Science Week, a focused service of 48 events in June 2005 that highlighted the contribution of social science research to the UK's economic and social well being.

PROVIDING LEARNING, TRAINING AND DEVELOPMENT OPPORTUNITIES

44. Rationale: We create opportunities for our stakeholders to learn new ideas and approaches as well as update their knowledge.

45. We commissioned and managed the development of a new major web-based resource, the Knowledge Transfer Guide which serves as a companion to the Communications Toolkit. The KT Guide draws on research to identify the important principles of knowledge transfer; explains different methods and approaches; and presents case studies of best practice. Opportunity is given to those who access the resource to engage with others to benefit from exchanging experiences.

46. We organised two workshops, “Getting Research into Practice,” for those on funded ESRC programmes. The workshop content included the principles of knowledge transfer, alternative means of user engagement, evidence from research and input from policy makers who draw on research as well as researchers who have actively engaged in policy development.

47. ESRC organises workshops for researchers to engage with the media; politicians on contemporary social and economic issues; and research on political processes.

OFFERING A HIGH QUALITY BROKERING SERVICE

48. Rationale: In addition to the formal/semi-formal systems and processes identified in previous sections, Knowledge Transfer also facilitates a central role in enhancing networks and satisfying its stakeholders by providing advice, sources of information, summaries of research, identifying expertise and making available research reports.

49. We have maintained a broad knowledge of ESRC research and national developments so that we can provide a high quality brokering service of informal advice.

50. More formally, the ESRC Council approved the appointment of two types of knowledge brokers. One will work with the Communications Team and provide a conduit between researchers in an area of common interest and audiences by using the media and publications as key vehicles. The other will be associated with the Knowledge Transfer Team and will be intermediary between researchers, business and policymakers in regional settings.

ASSESSING THE CONTRIBUTIONS RESEARCH, KNOWLEDGE TRANSFER SCHEMES, EVENTS AND OTHER ACTIVITIES MAKE TO KNOWLEDGE TRANSFER

51. Rationale: Given our commitment to the utilisation of knowledge, we believe that it is important to assess the impact of the activities we support and organise so that we can improve our processes as well as judge the value of what we do.

52. We have followed up over 100 end-of-award reports considered 9–12 months earlier by the Evaluation Team. We look for evidence of user engagement during the research enterprises, how it evolved, and its impact and best practice examples. Worthwhile case studies are identified and commissioned to provide training resources or are linked to the Knowledge Transfer Guide as a model to others.

53. We have, with Communications, conducted a survey of Social Science Week participants in 2004 and 2005 not primarily to evaluate individual events but to understand how the research findings that are presented are utilised by attendees. They are also followed up 10–15 weeks after Social Science Week and asked what they did with the contacts they made and the new information they gained. Findings have influenced advice to event organisers.

PLANNING AHEAD

54. Whereas the previous section drew on the ESRC's Knowledge Transfer Strategy to highlight the achievements in this area over the past 18 months, the next section uses the Output 2 Framework to summarise plans for the next three years.

INTERACTION WITH BUSINESS AND PUBLIC SERVICES

55. Active concordats will be expanded (more activities with existing partners) and new partners added eg DfID, FCO, ONS, RDAs, strategic alliances with umbrella organisations in the business sector; and specific companies will be developed. The April 2006 staff appointments will have this activity as a primary focus.

56. Alliances with RDAs will be strengthened, in part using the RC-RDA Capacity Fund and the ESRC brokers' scheme.

57. Knowledge transfer activities with local authorities will be enriched based on a business plan that is being jointly funded by ODPM and LARCI.

58. Interaction with the community and voluntary sector will increase, building on the concordat signed with the NCVO, and accessing funds from the Big Lottery Fund.

59. The number of public policy and business-oriented seminars and workshops will double.

60. Our Impact Grants Scheme has been introduced as a pilot to provide resources for centres and large grants to undertake knowledge transfer activities to facilitate the utilisation of their research findings.

61. User representation on ESRC bodies and external ESRC representation will increase. The Communications and Information Committee (CIC), a sub committee of the ESRC Council, which advises on Knowledge Transfer and Communications activities, should be an exemplar.

COLLABORATIVE RESEARCH

62. As required by the Innovation Report, the amount of collaborative funding that the ESRC will generate will increase. The ESRC has established a Venture Fund which is designed for this form of funded research.

63. Initial projects include demographic trends in Scotland and preventative public health research.

64. The number of jointly funded research projects will also increase. Potential partners are seeking opportunities to fund research jointly with the ESRC.

COMMERCIALISATION OF RESEARCH

65. The ESRC will organise workshops, either on its own, or with partners (eg AURIL) to develop the entrepreneurial and commercialisation skills of its researchers.

66. The ESRC will sponsor research and make its findings readily available on spinout companies and other commercialisation processes.

67. Knowledge Transfer is planning a weeklong residential course on entrepreneurship for its studentships holders, jointly funded with RDAs and the Scottish Executive, and facilitated by the Cambridge-MIT consortium.

68. Knowledge Transfer will continue to co-sponsor with other Research Councils the Business Plan Competition that provides business development skills for teams who have a potentially commercial idea that they wish to develop.

CO-OPERATIVE TRAINING

69. One of the reviews that the ESRC is currently conducting is on the effectiveness of its knowledge transfer schemes, particularly CASE, Knowledge Transfer Partnerships, jointly-funded studentships with Government departments as well as the knowledge transfer function of standard studentships. Initial findings suggest that those schemes which emphasise interaction between business and academics through doctoral students or graduate associates are seen as being worthwhile and beneficial by all parties involved—employers, academics and graduates. If these findings are confirmed in the final report, the ESRC would look to expand those schemes that are effectively fulfilling their purpose.

70. Knowledge Transfer will continue to monitor the impact of these schemes and collect case studies of good practice so that all parties can maximise the benefits they get from being involved.

PEOPLE EXCHANGES BETWEEN THE SCIENCE BASE AND USER ORGANISATIONS

71. The ESRC has introduced a research brokers' scheme to appoint intermediaries to facilitate interaction between those who apply research findings and those who generate new knowledge.

72. The ESRC has approved a Placement Scheme whereby researchers will spend time in a Government department providing the research evidence that can be drawn on to develop or review policies. As well, Fellows on this scheme will be expected to run workshops on the research methods in which they gave expertise.

73. Should this scheme be successful, Government employees will be supported to spend time with ESRC researchers in academic units to work on policy-relevant research projects.

74. Placement Schemes will then be extended to the business and voluntary sectors.

75. Knowledge Transfer will continue to give recent graduates workplace experience following introduction of a new scheme in August 2005.

Annex 6

Medical Research Council (MRC)

RESEARCH COUNCIL SUPPORT FOR KNOWLEDGE TRANSFER

INTRODUCTION

1. The mission of the Medical Research Council (MRC) is:

- To encourage and support high-quality research with the aim of improving human health.
- To produce skilled researchers, and to advance and disseminate knowledge and technology.
- To improve the quality of life and economic competitiveness in the UK.
- To promote dialogue with the public about medical research.

2. The 50+ years since the discovery of the structure of DNA have seen extraordinary advances in basic biomedical science and its application to tackling medical problems. The MRC has been at the forefront throughout that time. Our achievements include major impacts on health and the development of new breakthrough technologies applied by industry (see below), as well as fundamental insights into biological systems.

3. Some impacts of MRC research on health:

- Establishing that smokers lose a decade of life compared to non-smokers.
- Showing that surgery for stroke can halve the risk of a subsequent one.
- Demonstrating that screening for abdominal aortic aneurysms is cost-effective, saving over 3,000 lives after four years in the 65–74 age group.
- Showing that cholesterol-lowering drugs can reduce the risks of heart attacks and strokes by at least one-third.
- Saving NHS resources and lives, by showing that corticosteroids in severe head injury do more harm than good.

4. Some examples of MRC activity leading to the use of new technologies in industry and healthcare

- Funding the initial research behind the MRI scanners now present in every main hospital.
- Developing “humanised” monoclonal antibodies, now used by industry as the basis of a whole new class of antibody-based treatments.
- Funding many technological breakthroughs (eg DNA and protein sequencing, DNA chips and phage display) that have underpinned the genome programme and the biotech industry.
- Creating 16 start-up companies employing over 1,000 people.

5. The next decade will see two main thrusts. Firstly, advances in knowledge at the molecular level will rapidly be extended to a more integrative scale: increasing understanding of how cells, organs and organisms function, grow and develop—in health and disease. The emphasis will be on multi and inter-disciplinary approaches. Secondly, there will be a far greater focus on translating the results of such work into improved healthcare, products and services. Increased understanding of the social, behavioural and psychological factors involved in ill-health will result in new approaches to promoting public health.

6. The MRC Delivery Plan describes how we will use our resources during the current Spending Review period (2005–06—2007–08) to contribute towards achieving the Government’s objectives for the science budget, set out in targets for the OST and in the Science and Innovation Investment Framework. The Plan explains how the MRC will help implement the Government’s medical research agenda, as well as the MRC’s own vision and strategic priorities, accelerating the pace with which MRC research helps to achieve national health and economic goals (see below).

MRC FUNDING AND STRATEGY

7. The Council believes that the particular challenges in delivering a broad research agenda with the ultimate aim of improving human health require the following range of approaches to research funding in MRC:

- Intra-mural support—MRC Units and Institutes located in/closely integrated with research-intensive universities and, where appropriate, hospitals
- Extra-mural support—with research funding for researchers through a range of grant schemes, and
- Personal award (Fellowships, studentships) for research training and career development.

8. MRC retains the Intellectual Property rights for research within its own Units and Institutes, but for extra-mural research the Host Institution manages these rights.

9. MRC funding was £435.5 million in 2004–05 with the following distribution by scientific area:

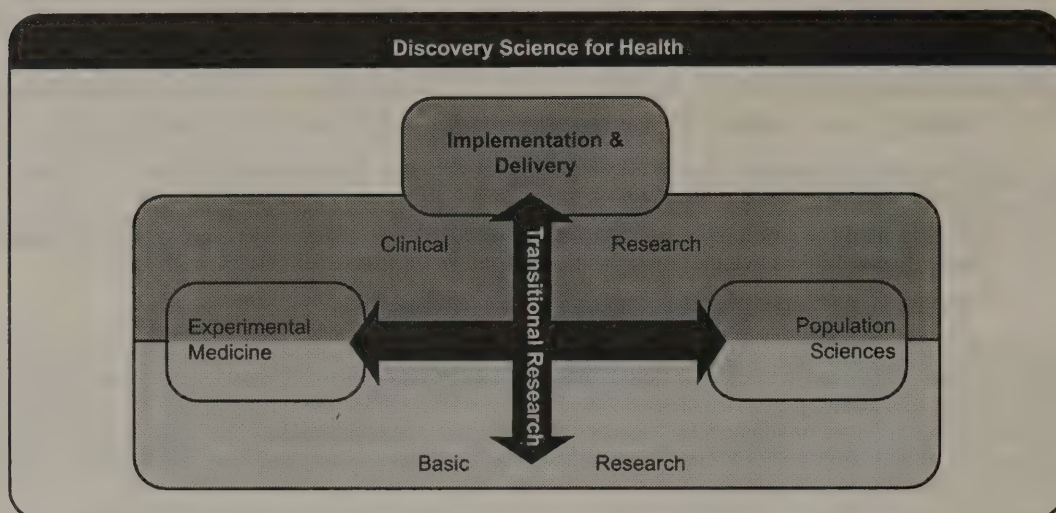
- 39% molecular and cellular medicine
- 15% physiological systems & clinical sciences
- 17% neurosciences and mental health
- 16% infections and immunity
- 13% health services & public health

7. MRC priorities include:

- Clinical Research and Public Health
- Infections and Vaccines
- Biomarkers
- Stem Cells
- Maintaining health of disciplines

THE CLINICAL RESEARCH AND PUBLIC HEALTH AGENDA

11. Clinical research is at the heart of the MRC's mission to promote research that will improve and maintain health. We have a long history of supporting a wide range of clinical research and of training future leaders of clinical research. Clinical research (see Figure) is designed to answer questions about human disease—its causes and origin, prevention, diagnosis, outcome and treatment. It is first and foremost about people and is pivotal to a continuum that extends from the laboratory, to patients, and through them to the health of the whole population. And the flow is not only one-way. It is becoming increasingly clear that just as basic science can lead to better patient care, so studies in people can provide key insights for basic science.



12. The MRC is active in relevant areas of basic, translational and clinical research, and is well placed to play a big role in this new push to improve health. Our public health research looks at the wider influences on physical and mental well-being and ill-health; for example, the biological, socio-economic, lifestyle and environmental factors at play throughout people's lives. It includes all aspects of health promotion, disease prevention and healthcare provision. A key aim is to understand how and why ill-health varies within the population, and how to improve public health through interventions and improvements that address these inequalities. A call for proposals in methodology including research which develops knowledge about how to implement research findings in policy and practice was issued in December 2005. The MRC conducts a wide portfolio of clinical trials across the spectrum of disease and tests new approaches to prevention, diagnosis and treatment.

13. The MRC has been allocated £25 million new money during the SR2004 period to take forward the clinical and public health research agenda, and will be redeploying a further £37 million of its existing funds from 2005–06 onwards to this end. Therefore the MRC expects to allocate an extra £62 million to drive forward the clinical and public health agendas, raising its annual spend from £127 million per annum to about £162 million per annum by 2007–08, as described in its Delivery Plan.

14. The MRC's strategy for strengthening translation of basic research into direct clinical and economic benefits is to:

- Increase support for experimental medicine—patient and volunteer studies based on the latest basic knowledge. A call for proposals in experimental medicine was issued in September 2005 and focused on the early testing of novel treatments or interventions in human participants.
- Raise funding for clinical trials and other population level studies; for example, on interactions between environment, behaviour and predisposition to disease.
- Promote translational research approaches—where there is a vigorous exchange of ideas, methods, people and priorities between basic and clinical sciences. A Call for Centre Grant applications to strengthen translational research in the UK was issued in January 2006. The MRC will create a new cadre of research translators to further promote knowledge transfer.

15. The Government has asked the MRC and the Health Departments to build on their existing partnership and further accelerate the translation of basic research results into improved health. As well as participating in the UK Clinical Research Collaboration, MRC and the Health Departments have set up a Joint MRC / HDs Health Research Delivery Group (chaired by Sir David Cooksey) which aims to provide enhanced strategic co-ordination between the public funders of medical research.

16. The Joint Health Delivery Group, as part of its work, is developing an overarching strategic plan for working with industry, from pre-competitive preclinical research through to large scale clinical trials. Care is being taken to co-ordinate, and not duplicate, effort with the activities of UKCRC on clinical trials in this area.

BIOMARKERS INITIATIVE

17. The shift towards a more holistic approach to the study of health and disease, as exemplified by systems and integrative biology, provides new impetus for developing the science of biomarkers. Dramatic advances in “-omics” technologies have led to high expectations for the emergence of a new range of biomarkers, providing deeper insight into the behaviour of disease and response to drugs, which will allow quicker development of novel therapies of proven benefit. A UK conference on Biomarkers, sponsored by the MRC is being held in January 2006 to address the extent to which this expectation can be met and identify how the UK can best contribute to the international research effort in this area through capitalising on its infrastructure and scientific strengths. Participants will be drawn from academia, the pharmaceutical industry and drug regulation, covering a variety of cross-cutting medical disciplines.

Commercialisation of R&D

18. MRC collaborates with industry on a broad basis and takes a proactive approach to engaging industry through our affiliated company—MRC Technology (MRCT). MRCT is responsible for exploiting the intellectual property rights (IPR) from research in MRC research establishments (institutes and units). MRC's objectives in technology transfer are:

- to work through the mechanism, and with the partner(s) judged most likely to develop MRC technology into products and services useful to Society;
- to maximize the contribution to national wealth creation and UK industrial competitiveness;
- to maximize income to the MRC in the medium-to long-term.

19. Between 1987 and 2004, MRC received over £102 million income from exploitation of its IPR, and granted around 457 licences. MRC's commercial income was £28.5 million in 2004–05. Expenditure on commercialisation was £9.3 million. This level of licence income is equivalent to 9.17 per cent of research expenditure on MRC institutes and units which, on the basis of the most recent comparative figures available, is more than three times the proportion achieved overall by US universities and around 15 times the level in UK universities.

New class of pharmaceuticals

20. MRC research in antibody engineering started in the mid 1970s. MRC patents cover a series of inventions from the MRC Laboratory of Molecular Biology during the late 1980s and early 1990s for making ‘humanised’ or fully human monoclonal antibodies. These technologies have had a major impact on health and the economy in the last decade. Eleven therapeutic antibody products are now marketed arising from MRC patented technologies (antibody humanisation and phage display), including treatments for breast cancer, leukaemia, infant respiratory disease, asthma, psoriasis, kidney transplant rejection and rheumatoid arthritis. 32 more products are in late stage (Phase II and III) clinical trials.

21. In late 2005, MRC signed one of the biggest deals to come out of breakthroughs by UK scientists. It involves a drug created using patented antibody technology derived from research at the Laboratory of Molecular Biology and the Scripps Research Institute in California. The drug, HUMIRA(r), is so far used to treat rheumatoid arthritis, early rheumatoid arthritis and psoriatic arthritis. The American pharmaceutical company, Abbott has agreed to pay money in lieu of the future royalties the MRC, the Scripps Research Institute and Stratagene would have received on sales of HUMIRA(r). The MRC has received £112 million as a result of this deal.

MRC Start-up Companies

22. Two of the largest UK biotechnology companies, Celltech and Cambridge Antibody Technology originated as start-ups based on MRC technologies and fifteen other MRC start-up companies have either merged with others prior to listing or have attracted substantial venture capital or corporate financing as private companies.

23. In March 2005, Ardana Bioscience Ltd, became the first MRC start-up company since Cambridge Antibody Technology (CAT) to be floated directly on the London Stock Exchange, although some other listed biotechnology companies such as Vernalis and BioFocus derive in part from MRC start-ups which merged with other entities. The listing raised £21 million before expenses. Ardana, a biotechnology company based in Edinburgh, was created in 2000 on the basis of licences and options to intellectual property arising in the MRC Human Reproductive Sciences Unit. Although Ardana subsequently acquired rights to nearer to market products from other companies, it continues to develop earlier stage technologies arising in the Unit and, prior to listing, agreed a revised and more focussed option agreement with MRC that will take effect in July 2005. Under the agreement MRC received further shares, a royalty provision and funding for additional research in the Unit.

24. The number of employees in MRC start-up companies (excluding Celltech) was 1,135 at March 2005.

MRC Development Gap Funding

25. Following a successful pilot scheme, MRC in 2003 approved a £4.5 million proof of concept fund managed by MRCT to support further research and reduction to practice on initial results with commercial potential that arise in MRC establishments. The research is project-managed to deliver to commercially relevant targets. Through this mechanism, MRC is able to develop its intellectual property into more robust and commercially attractive opportunities. The earliest projects are now complete or nearing completion and efforts are underway to partner or license the IPR generated. A symposium for project leaders was held in September 2005.

26. The Development Gap fund has also been used to leverage interest in speculative research, with potential commercial application, from industry. One example of this is a three-year collaboration between MRC Laboratory of Molecular Biology and Pfizer the world's biggest pharmaceutical company on the three-dimensional structure of human G protein coupled receptors—a class of drug targets that have been key to advances in the search for medicines to treat conditions where medical need remains high.

MRC Drug Discovery Group

27. MRCT's own dedicated applied research laboratories have helped bridge the gap between basic research and the needs of industry. The MRC is also creating a Drug Discovery Group to identify and progress MRC research offering starting points for drug discovery, to aid translation of basic science and improve commercial exploitation. The group is being built on existing strengths within MRCT, which already has a group of scientists who screen potential drugs at its laboratories in Mill Hill, north London. A significant group of medicinal chemists will be recruited and the biology group will be expanded, with the objective of creating an enhanced screening capability and 'hit to lead' chemistry to help accelerate the translation of MRC's cutting edge biology into innovative new therapies. The Group's remit will span the entire range of research fields funded by the MRC, including potential drug targets in neglected diseases and prospective targets currently regarded as too high-risk by the pharmaceutical industry. As with MRC's investment in antibody humanisation, the DDG is a long-term strategic investment and healthcare and economic benefits are expected in a 10–15 year timescale.

COLLABORATIONS WITH INDUSTRY

28. In addition to work carried out within MRCT's laboratories, MRC Institutes and Units are encouraged to engage in collaborative research with industry. A striking example is the collaboration between the MRC Protein Phosphorylation Unit, and the University of Dundee's School of Life Sciences with six of the world's major pharmaceutical companies—AstraZeneca, Boehringer Ingelheim International GmbH, GlaxoSmithKline, Merck Co, Inc (of Whitehouse Station, NJ, USA), Merck KGaA (of Darmstadt, Germany) and Pfizer. In 2003 the companies agreed to provide further funding of more than £15 million over five years to investigate two classes of enzymes, termed kinases and phosphatases, which have become some of the most important classes of drug target in the pharmaceutical industry. Overall the collaboration will have provided funding in excess of £21.5 million over ten years and supported the creation of over 20 new scientific posts within the specially created Division of Signal Transduction Therapy. Novel pathways and targets have been dissected and a number of patent applications licensed by MRC to partners within the consortium and more widely.

MRC SHOWCASE DAYS

29. MRC and MRCT are planning a series of theme-based Showcase Days to improve communication between MRC-funded scientists (intra- and extramural) and Industry. The objectives are to strengthen links in the UK bioscience community and to develop new collaborative research programmes between academia and Industry.

OTHER INTERACTIONS WITH COMMERCIAL USERS

30. MRC also contributes to knowledge transfer through:

- Sponsorship of LINK programmes (most projects supported are university-based). MRC is a co-sponsor with BBSRC and DTI of the Applied Genomics LINK Programme.
- Collaborative Studentship Awards.
- Industrial Collaborative Studentship awards.
- Encouragement of industrial consultancies for MRC staff within guidelines and where approved by management.
- Financial support to, and assistance with managing, the joint Research Council Business Plan Competition and the Biotechnology Young Entrepreneurs Scheme.
- Support of MRC Conferences with academic/industrial participation.

- Training by MRCT staff in Intellectual Property and commercialisation for newly appointed MRC scientists in units and other seminars given by MRCT staff to University postgraduates.
- MRCT staff making a major contribution to the Praxis training programme for technology transfer professionals.

PEOPLE AND SKILLS

31. The MRC's priorities in research training include implementing relevant recommendations of the Roberts Review concerned with enhancing the attractiveness of research careers and the standard of training. MRC funds about 400 new PhD students each year. The MRC is also increasing flexibility in the provision of postgraduate training through Doctoral Training Accounts (DTAs). In integrative physiology/pharmacology, which are priority areas for strengthening, MRC is partnering a consortium of pharmaceutical companies which has set up a fund to support in vivo research and training at PhD and postdoctoral level.

OBJECTIVES AND DELIVERABLES

32. Progress against the specific objectives in the MRC Delivery Plan will be reported in the form of a Balanced Scorecard and monitored using an agreed cross-Council Output Framework. This is in addition to existing channels of accountability, including the Annual Report to Parliament and the Annual Review. Summary deliverables in relation to Knowledge Transfer are:

- Over SR2004: a significant reprioritisation of MRC spending, with increased funds for clinical and public health research and training; increase external income from collaborative research with users; increase income from exploitation, patenting and licensing; establish new Drug Discovery Group.
- Medium term: increase in the volume of MRC-supported translational research, experimental medicine and research in population health sciences; increased recruitment to MRC trials; closer working with industry; increase translation of basic MRC science into healthcare improvements; transfer of MRC drug discovery programmes for neglected diseases to public-private partnerships or other vehicles to progress treatments to clinic; delivery of high-quality research reagents back to MRC scientists.
- Medium and long term: As tokens of industrial satisfaction, we expect to be able to demonstrate specific industry/MRC partnerships including industry-funded academic consortia, and matched investment; also approval of new drugs by the US Food and Drug Administration and the Medicines and Healthcare products Regulatory Agency, which will benefit industry and health in the UK. At steady state, the Drug Discovery Group will evaluate 12 new targets, translating ultimately into one high-quality lead molecule each year.
- Long term: a major impact on diseases of significant health burden.

Annex 7

Natural Environment Research Council (NERC)

RESEARCH COUNCIL SUPPORT FOR KNOWLEDGE TRANSFER

INTRODUCTION

1. NERC is one of eight Research Councils. It supports research and training in its four wholly owned research centres (British Antarctic Survey, British Geological Survey, Centre for Ecology and Hydrology and Proudman Oceanographic Laboratory), 15 collaborative centres, UK universities and, in the case of one scheme, supports research in companies. Its budget is approximately £350 million per year.

2. NERC recognises knowledge transfer as a complex two-way process and that it should be integrated into the whole research process, from the early stages of project identification and definition to the final stages of completion and dissemination.

3. NERC has a very broad range of users, spread across diverse industry sectors. These include a wide range of major UK and international companies, plus SMEs. In addition to this direct KT business interaction, NERC also has a broad range of other user interaction, such as peer reviewing (over 11% of our Peer Review College are from user organisations) and representation on NERC advisory and decision-making bodies. The industry sectors that NERC contributes to are significant: the environmental technologies and services sector in the UK alone is worth £15billion (source: JEMU 2002).

4. More significantly, NERC science plays a key "public good" role, providing vital science advances for developing environmental policy, regulation and management. Government Departments and Agencies, such as DEFRA and the Environment Agency, are key NERC science users.

NERC KNOWLEDGE TRANSFER STRATEGY

5. NERC's knowledge transfer strategy has four main components:

- Involve users in planning, implementation and review;
- Fund the best knowledge transfer ideas across the NERC remit;
- Integrate knowledge transfer within strategic science programmes;
- Promote entrepreneurship and commercialisation of research.

6. Underpinning these strategic objectives is a range of schemes and initiatives, for example our annual call for knowledge transfer (see Box 1). This call will be flexible enough to support the best KT ideas. NERC will continue to work through the RCUK KT Group to coordinate support where it matches the needs of our user community. To provide a baseline for current knowledge transfer and business interaction activity we have developed a suite of metrics, agreed by OST, which will be used to measure progress towards our objectives.

Box 1 Knowledge Transfer Call

NERC has a unique approach to knowledge transfer across the research councils, in that it runs a specific annual call for knowledge transfer proposals. The first two calls, in 2004 and 2005, have invited applications in three categories: networks with users; collaborative research; and "good ideas". Recent awards include: support for people in key knowledge transfer positions, such as facilitators; special publications and websites; developing collaborations with local authorities; new research collaborations with users that should result in the application of research. In each of our first two calls we have committed over 31.5 million.

From the end on 2005 NERC will focus collaborative research within its existing research grant schemes and closing dates. We will continue to support an annual call, focusing on providing support for improving the application of scientific research within NERC's remit.

NERC RESEARCH AND COLLABORATIVE CENTRES

7. NERC's Research Centres provide a unique opportunity for all aspects of knowledge transfer: they provide a national capability to provide reliable and independent policy advice to Government. One example is the Centre for Ecology and Hydrology's lead role in the farm scale evaluation of GM crops. The skills and capabilities that exist in our research centres play a vital part in the UK economy: a recent survey estimated that the value added of national output that the British Geological Survey (BGS) contributed to was in the range £34 billion—£61 billion, between 5–8% of the UK value added. Links with key users are extensive: for example, the Proudman Oceanographic Laboratory is a partner with the UK Meteorological Office in the National Centre for Ocean Forecasting (NCOF), whose mission is to establish ocean forecasting as part of UK "infrastructure".

PLANS FOR KNOWLEDGE TRANSFER

8. NERC is implementing plans for knowledge transfer using the agreed RCUK framework:

- collaborative research;
- cooperative training and education;
- people and knowledge flow; and
- commercialisation.

A cornerstone of the plans is the development of a brokerage unit—see box 2.

Box 2 Brokerage Unit

NERC's Knowledge Transfer Advisory Group (KTAG), composed of industry representatives, policy-makers and members of NERC's major decision making groups, have endorsed the view that for NERC to increase its rate of knowledge transfer, support for a range of schemes and mechanisms is required to cover the breadth of knowledge transfer; but that more is needed if a sea change in the rate of knowledge transfer is to be achieved.

Whilst the Research Councils have identified four main categories of knowledge transfer, knowledge flow underpins all activities. Knowledge transfer is a 'contact sport' requiring extensive interpersonal exchanges to achieve successful outcomes. There is increasingly a clear need to provide a stronger link between the academic and user communities. NERC has also funded some specific projects (eg the Cambridge Institute for Aviation and the Environment, funded in the first KT call), however, a NERC KT unit covering the broad NERC remit, acting as an advanced signposting service for both the academic and user communities to contact each other, is a significant missing link in our KT portfolio.

The establishment of a NERC brokerage unit would be a unique UK-wide service for the environmental sciences. The concept of the unit is being developed by KTAG over the next six months, with the intention that the unit be operational by April 2007.

It could have the following characteristics:

- (i) Actively use information from successful grant applications on potential users, to develop these links (two-thirds of NERC blues skies grant holders indicate their science is relevant to policy);
- (ii) Act as the home for science to policy and science to industry facilitator posts;
- (iii) Develop good working relationships with the NERC science and user base, to ensure good take up of service.

The benefit of such a KT unit providing a brokerage service would be:

- (i) Help in the identification of user needs;
- (ii) Help to inform policy and policymakers and scientists of policymakers needs;
- (iii) Promote awareness and take up of KT delivery mechanisms, including those supported by NERC;
- (iv) Help to enhance business involvement in R&D;
- (v) The development of more commercially valuable ideas;
- (vi) Take forward some KT activities following on from directed programmes once the programme officially finishes;
- (vii) Increase leverage of NERC funds by obtaining co-funding from users;
- (viii) Potential, via cogent use of existing IT systems to undertake KT "mining", to identify possible user applications of research and take these forward, in collaboration with researchers and HEIs' business development staff.

A close relationship will be developed with Higher Education Innovation Fund (HE activities). There is a clear opportunity for ITERC to proactively develop improved mechanisms for the take up of NERC science, that can work with, not duplicate, infrastructure being supported elsewhere.

(a) Collaborative research

Key target: (i) Increase the number of co-funded collaborative research grants to 6% by 2007–08

9. NERC will increase the amount of research that we fund as collaborative with user involvement. Our new Partnership Research Grants scheme will give NERC increased flexibility to support collaborative research whilst remaining under the umbrella of a State Aids-approved product. We are using the same closing dates and moderating panels for this new initiative as our responsive mode grants. The first closing date is 1 December 2005.

10. Our research centres engage with users via significant amounts of commissioned research (£27.6 million in 2003–04), which reflects the skills and expertise that they have. They have developed stable funding models that require a balance of science budget and commissioned research money. There are no plans to increase the proportion of external research income to alter this balance.

11. There are also considerable opportunities for better knowledge transfer between NERC and the full and corresponding members of the Environmental Research Funders' Forum (ERFF). ERFF are exploring science priorities in the areas identified by their SWOT analysis: this should inform potential areas for collaborative research with government departments and public sector organisations.

12. NERC is running a project to help identify its technology priorities to feed into the national Technology Programme. This should report in the first quarter of 2006.

(b) Cooperative training and education

Key targets: (i) Increase CASE studentships; (ii) Enforce CASE studentship target; (iii). POST secondments

13. NERC is committed to supporting excellent postgraduate training via the MSc, MRes and PhD studentships. The main KT routes that NERC supports are through user-relevant MSc courses and CASE and Industrial CASE (Cooperative Awards in Science and the Environment) PhD studentships.

14. NERC supported 307 CASE and 78 Industrial CASE studentships in 2003–04, spending nearly £4.5 million. Over 120 organisations are collaborating directly in NERC-supported PhD training. We are:

- Expanding our Industrial CASE annual competition to include public sector partners, in recognition of the important role that NERC science plays in public good and policy development. We will increase the number of places supported in the call by up to 50%.
- Enforcing a minimum of 30% of NERC algorithm studentships to be CASE awards. Departments not meeting this target will be penalised.
- Currently undertaking a zero-based review of NERC support for MSc courses for the next five years. There will be considerable user involvement in the process, with user relevance an assessment criterion and user membership on the review panels.
- Continuing to offer four secondments per year to spend three months at the Parliamentary Office of Science and Technology (POST) writing briefing notes for parliamentarians, and investigating similar placements in the Scottish Executive and the Welsh Assembly.

(c) People and knowledge flow

Key targets: (i) Development of a Brokerage Unit; (ii) Increase support for networks, Knowledge Transfer Partnerships and facilitators.

15. NERC undertook a user survey in 2004; one of its main outcomes was the importance of formal and informal links between scientists and users. A number of our major Directed Programmes have started to employ facilitators to increase knowledge transfer. We are currently advertising for a science to policy facilitator, and we will also explore partnership arrangements for more industry-focused facilitators with R/DAs. We have also supporting facilitators within some of our major directed research programmes and in the annual KT call. NERC will increase the number of facilitators to actively link our research with firms and help them identify the potential in a range of NERC research projects and programmes. The user survey stressed the importance of formal and informal means of communication between potential users and the research community (for engagement at all stages of the research process) we intend to increase our communication with potential users through increasing our support for our networks scheme. These approaches will be maximised by working closely both with the range of channels there are in universities, RDAs, trade associations and professional bodies.

16. NERC has been a sponsor of the national Knowledge Transfer Partnerships scheme for over 10 years. We intend to increase our support for this scheme, and have been doing so via three main routes: by developing a strong working relationship with Momenta, who manage the scheme; raising awareness of NERC with KTP project offices (mostly based in universities); and increasing awareness of the scheme with academics that work within our remit. Box 3 gives details of our plans.

Box 3 Knowledge Transfer Partnerships

NERC's current support for this scheme, one of DTI's business support products, is about £100k pa. To help stimulate awareness of the scheme NERC will:

- Increase its level of support for KTP, conditional on the quality and relevance of proposed projects to NERC's mission;
- Continue to promote the scheme, via specific KTP awareness-raising seminars, and using RDAs to promote via their environmental technology clusters.

17. To encourage the two-way flow of people between the research community and industry, NERC is a sponsor of the Royal Society Industry Fellowship scheme—for more details see www.royalsoc.ac.uk/funding/.

18. NERC has good working relationships with its sister Research Councils. We will use these strong links to work collaboratively with other councils where a common agenda exists: for example working closely with EPSRC on developing good links with the Environment Industries Unit and with ESRC and others for the Local Authority-Research Council Initiative (LARCI).

(d) Commercialisation

Key targets: (i) 26 new commercialisation ideas; 16 applications to the Innovation Fund; two patents filed; and seven deals agreed from NERC Research Centres in 2005-06; (ii) Business Plan Competition, Follow-on Fund, commercialisation awareness-raising events.

19. NERC is committed to ensuring that its science is fully exploited. This has two facets: for the science in our four wholly owned research centres, NERC retains the intellectual property; and for the science we support in our collaborative centres and UK universities, the intellectual property is transferred to the host institution, which is in a better position to exploit the science. The Higher Education Innovation Fund (HEIF) and its precursor funding activities support this latter activity.

20. NERC ensures that the science undertaken in its own research centres is exploited where appropriate—NERC employs some 2600 staff, of which 60% are active scientists. NERC employs Exploitation Scouts to identify and develop early-stage commercial opportunities and intends to extend this network by creating additional, part-time roles. In 2005 NERC developed a strategic partnership with ISIS Innovation, one of the UK universities' leading technology transfer organisations, to increase the rate of commercialisation from our four research centres.

21. NERC researchers have access to an Innovation Fund, to help bring commercial opportunities to a point where they can be successfully licensed or attract external finance to establish joint ventures or spinout companies. The Innovation Fund enables researchers to obtain funds for the very earliest stages of a new business opportunity, supporting, for example, obtaining a patent or buying advice on market size. It also provides up to £100k to further develop selected opportunities to bring them to the point where they can be licensed or attract external finance. NERC researchers also have access to the Rainbow Fund, a seed fund set up with CCLRC, DSTL, PPARC and UKAEA. The fund has £4 million to provide financial support to the earliest stages of new commercial opportunities.

22. NERC also encourages commercialisation in its broader academic community. This will be strengthened in the following ways:

- NERC will continue to support the Research Councils' Business Plan Competition, working with the other Research Councils to develop partnerships with RDAs.
- NERC, together with BBSRC, EPSRC and PPARC run the Follow-on Fund, to increase the level and accelerate the rate of commercialisation of research ideas arising from research community by providing funds to enable these ideas to be brought to a stage where commercial opportunities (eg. licensing, seed or equity funds) can be secured. Since it started in 2004 NERC has supported seven projects.
- Support for the BBSRC-led Young Entrepreneurs Scheme (YES).
- Specific events: With the DTI/Defra Environment Industries Unit and EPSRC we are holding a commercialisation conference in November 2005 to raise awareness of the environmental technologies sector, currently a rapidly expanding market.

SCIENCE TO POLICY AND ENVIRONMENTAL MANAGEMENT

23. One of NERC's key areas for knowledge transfer is contributing to policy development and environmental management. In 2005 NERC published a new booklet "*Science to Policy: Taking part in the process*" <http://www.nerc.ac.uk/publications/scienceintopolicy/science-into-policy.pdf> to help NERC staff and the academic research community to: a) recognise the relevance of science to policymakers; b) identify opportunities, routes and good practice to influence policymakers; and c) communicate science in an accessible way.

24. NERC will focus its future science to policy activities in the following ways in the next few years:

- Implementing guidelines on engaging users at all stages of science, from the inception of new science ideas through to the completion of directed science programmes, and broadening this out to other areas of NERC activity.
- Increasing support for the secondment scheme for PhD students to work at POST.
- Employing a new science to policy facilitator, to help promote the take up of NERC science.
- Developing ways of synthesising the outputs of blue skies research to make them more accessible to policymakers/other end users.
- Holding more seminars bringing together scientists, policymakers and environmental managers in particular science areas.

- Holding issue-based meetings with government departments and other public sector bodies to explore how NERC improve its supply of scientific evidence to inform policy development.
- Developing best practice in communicating our policy-relevant science to policymakers.

INCREASING OUR INTERACTION WITH BUSINESS

25. NERC has a complex set of interactions with business. Its Research and Collaborative Centres undertake a broad range of interactions that reflect the needs of their own business plans. For two-way interaction between NERC and large firms with an in-house capacity a direct linkage is normally appropriate, whereas for smaller firms the channels may be opened up by; facilitators, the use of intermediaries, university technology transfer companies and business development teams, the RDAs and devolved administrations.

26. NERC ensures that public and private sector users are engaged in the development and running of major directed programmes. Following a recent transfer of funding from DTI, NERC is now responsible for a major space programme, and works directly with space supply and service industries, public sector and commercial customers to deliver its programmes, and a broad range of wider benefits.

WORKING WITH THE REGIONS

27. NERC recognises the increasing importance that the RDAs and Devolved Administrations (DAs) play in knowledge transfer. NERC is in a strong position to increase its interaction with these organisations due to the distributed nature of the NERC Research Centres across the UK. NERC will continue to develop these working relationships through its Research Centres, with support from NERC Swindon Office. RDAs are potentially very important for some industry sectors, particularly those composed of predominately SMEs, as the RDA sector groups may be in a stronger position to access these companies. One example is the environmental technologies and services sector: not only is this an important business sector for NERC but it is also identified by all the RDAs as a priority for the economic prosperity of their regions.

EVALUATION

28. NERC is committed to ensuring that its investments have an impact on society and the UK economy, and has agreed a range of metrics with OST to measure the exploitation of our investments. In addition, to better understand NERC's impact, we are currently running a study to better measure our economic impact. This is being done by using 10 representative case studies and using methodology that conform to the HM Treasury guidelines on appraisal and evaluation in Government, to ensure that the outcomes of the study are realistic and fully justified.

Annex 8

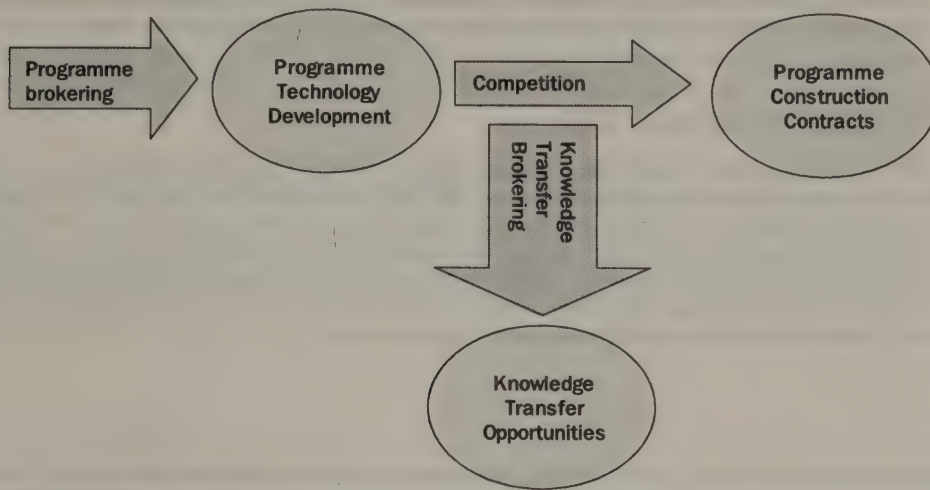
Particle Physics and Astronomy Research Council (PPARC)

RESEARCH COUNCIL SUPPORT FOR KNOWLEDGE TRANSFER

INTRODUCTION

1. PPARC's primary goal is to deliver a ~£300 million programme of basic and fundamental science in particle physics, astronomy, particle astrophysics and solar system science. Given the dependence of these areas of science on advanced research facilities, to achieve its science goals PPARC must develop advanced technologies. This technology is the key interface PPARC has with suppliers or developers of technology for its programme as well as with other users who can benefit from using PPARC technology in other contexts (referred to as knowledge transfer or "KT"). The whole programme of industrial engagement and knowledge transfer is therefore built upon maximising this technology dialogue.

2. Early involvement of companies in technology development often places them in an advantageous position when it comes to competing for contracts for the construction of facilities. There is a close relationship between technology development for the PPARC programme, KT, and contract return as illustrated by the diagram:



STRATEGY OVERVIEW

3. PPARC Council approved, in 2004, a strategy which features some key PPARC distinctions—notably a strong emphasis on brokering relationships and recognition that industry needs to be treated as a supplier of technology for the PPARC programme as well as a customer of knowledge transfer. Industry is attracted by the prospects of better contract return and increased KT potential leading to new market opportunities.

4. The strategy can be stated as follows:

- To support UK academic and industrial leadership in the PPARC programme through technology development.
- To spread PPARC technologies to broader market areas (industry and public sector including other academic disciplines) through industry and interdisciplinary collaborative research.
- To support entrepreneurial activity in the PPARC community.

5. There are a number of additional elements to this strategy which include:

- long term science and technology planning;
- brokering (particularly to manage “non-traditional” sectors);
- providing flexible and evolving funding streams focused on desired outcomes;
- supporting enterprise;
- single branding (for all knowledge transfer, innovation, technology and enterprise activities) through the PPARC “KITE Club”;
- a partnership mentality (utilising other schemes as appropriate, co-ordinating activities); and
- stimulating UK contract return.

PROGRAMME OVERVIEW

Collaborative research for technology development for the PPARC programme

6. PPARC has implemented a programme of engagement with industry involving:

- Identification of future science priorities by Science Committee.
- Identification of the technologies required to achieve the science goals.
- Promotion of the technology plans and opportunities to industry and other potential technology development partners.
- Creation of a new funding line for technology development across the whole PPARC programme which is open to funding any entity, including industry, which can demonstrate the ability to achieve the necessary technological performance. This may involve collaborative funding or full funding where it is justified by the return to PPARC. Where collaborations involve SMEs, this will count towards the Small Business Research (SBR) target.

- Promoting the formation of consortia to undertake R&D for the programme with direct funding to industry for the work they undertake. Calls may be targeted to specific areas.

Collaborative research for knowledge transfer

7. The PPARC Industrial Programme Support Scheme (PIPSS) has been refocused on knowledge transfer and mobilisation and extended to include a wide range of types of funding support. It has recently received State Aids approval, enabling PPARC to fund industry. This mitigates the risks inherent in commercial organisations comprehending new and novel technologies and helps to ensure that publicly funded technologies are as widely exploited as possible. Increasingly PIPSS will be used as a brand to identify PPARC's contributions to schemes involving other partners as appropriate including Follow-on Funding, Knowledge Transfer Partnerships and Discipline Hopping awards.

Training

8. A study of the career paths of PPARC PhD students (DTZ Pidea Consulting July 2003) reported that 48% of PPARC PhD students end up in the private sector. Skills developed during a PPARC PhD, such as technology, maths and computing, team working, and international cooperation are highly desirable in a range of sectors including the city, major industrial companies and small IT companies. This is independent of whether the PhD had a collaborative component. PPARC is committed to increasing its volume of PhD training with a range of goals including increasing the supply of highly trained staff to other employers. By 2007 it will have increased its student numbers by 50% (from 2003) giving a total stock of 850 p.a, providing an increased number of students to the open market. PPARC also supports up to 10 CASE students per year, with the CASE Plus option of a fourth year in the sponsoring company.

People and knowledge flow

9. PPARC supports an active programme of brokering and networking to increase the awareness of industry and other users and the academic community of each other's strengths, needs and opportunities. This takes place through a programme of visits and workshops under the auspices of the KITE (Knowledge, Innovation, Technology and Enterprise) Club. It is supported by a contractor appointed to bring both technical and commercial experience into the programme (the KITE Club Innovation Advisory Service). These activities create an interactive environment which underpins all the other activities. The contract was retendered in 2005, and the new 3 year contract will double activity by 2007. The brokering programme is enhanced by support from the OST PSRE (Public Sector Research Exploitation) line to enable equivalent work to be undertaken with CERN (the European Laboratory for Particle Physics). PPARC has been successful in bidding, under PSRE3, to extend this activity to its other major international research programmes—ESA (the European Space Agency) and ESO (the European Southern Observatory). PPARC also supports schemes to support movement of people between sectors such as Knowledge Transfer Partnerships (KTP) and MRC Discipline Hoppers.

Commercialisation

10. Most exploitation of PPARC research is through existing companies. A new "PIPSS Fellowship" is being developed for staff wanting to increase their work with industry. However, PPARC also provides support for members of its academic community who wish to commercialise their research through the creation of spin-out companies. PPARC/Royal Society of Edinburgh Enterprise Fellowships are awarded to individual young researchers seeking training in venture creation and time to develop their research into commercial propositions. The Rainbow Seed Fund is available to staff at the UKATC and CERN for the commercialisation of work developed from these organizations in the Public Sector Research Establishment (PSRE) context. PPARC is also a sponsor of the Research Councils Business Plan Competition.

Interactions with business

Supply contracts

11. PPARC, together with UKTI, funds an Industrial Liaison Officer to promote contracts at CERN and ESO to UK companies, and is working closely with BNSC to promote contracts at ESA. A wide range of companies have been made aware of the opportunities for contracts, but UK industry has not been particularly successful in its tendering, and the UK return coefficients are poor. This is in part due to economic conditions, and in part because companies are poorly prepared in the underpinning technology development. PPARC has promoted the development of a strategy for industrial engagement in Research

Facilities with other stakeholders, and has recently agreed with DTI and others to extend the Sensors Knowledge Transfer Network with a specific workpackage on Research Facilities. This and the strategy of early industrial engagement in R&D through PRI are addressing this concern but the impact on supply contracts is still some way off.

PPARC interaction with business and public services

12. PPARC Council has members from industry and DTI to ensure input from these perspectives. There are also industrial members on the Education, Training and Careers Committee. Industrialists are involved in the peer review of projects with a collaborative component to assess the industrial component and the overall technical objectives.

Interaction with RCUK

13. PPARC participates in joint programmes with other Councils, such as the Research Councils Business Plan competition, the Rainbow Seed Fund and the Follow-on Fund, where these deliver a generic opportunity to the research community. For some activities, demand is low but the Council, nonetheless, wishes to ensure that its research community has access to services and funding.

Other Interactions

14. PPARC will continue to seek contributions from third parties towards its research programme and KT activities in addition to collaborative grants. This may include joint funding from another government department (eg MoD Joint Grants Scheme or DoH funding), from an RDA associated with a major research centre (eg the Cockcroft Centre), or from an international partner for a UK-led technology initiative (eg MICE). PPARC is also in active discussions with DTI, in the context of the Government's Technology Strategy, concerning industrial engagement in research facilities and advanced instrumentation. In addition to the workpackage on Research Facilities referred to above, a further workpackage on Advanced Instrumentation will also be implemented in the Sensors KTN to help coordinate the instrumentation industry which is widely recognised as being fragmented.

RISKS AND CHALLENGES

15. A fundamental risk with this strategy is that industry is not under PPARC control. Even with the enhanced exposure of our plans and needs to industry, and their engagement in early stage technology development, this may not lead to their participation in project development and supply. There has been a significant example in the past where a major supplier has changed their commercial goals and withdrawn from the science sector despite significant technology development and relationship building. This can be addressed by detailed exposure to all the issues at an early stage, so that as industry progresses with projects they are fully aware of the nature of the requirements. Joint funding with DTI, helping the industry to embed the technology in their core competencies for other markets, will also help to strengthen their potential. There are plans within the proposed new workpackages of the Sensors KTN to gather evidence through an international comparison of Government support for prototyping.

16. There is also a risk of a lack of enthusiasm from academics, who might consider their priority to be delivering the science programme. PPARC has surveyed the community and found that there is a strong will for further engagement with industry and other partners. Groups do need support in interacting with industry and developing partnerships, and this is being addressed by growth in the brokering programme and greater flexibility within PIPSS to meet the needs of the academic and industrial communities.

17. The strategy involves industry having access to funding for new projects from the earliest stage, so its success depends upon there being sufficient funds through the PPARC Grant in Aid and successive Spending Reviews to fund new projects. Although PPARC aims to enhance contract return to the UK, the ultimate decision is outside of PPARC control, being normally subject to international competitive tendering.

18. PPARC does not own IP from R&D conducted in support of its programme, instead it resides with the originators of the research. PPARC therefore has no control over the management of IP and negotiations concerning IP. With much of our research being conducted in large international consortia, there are frequently complex IP ownership and sharing agreement issues. PPARC aims to promote best practice in IP management and encourages consortia to establish appropriate IP agreements.

19. With the rising profile of KT, it is a continuing challenge to better co-ordinate PPARC support for KT with that of other organisations eg RDAs and HEIs.

PERFORMANCE MANAGEMENT

Collaborative R&D

21. By focusing PIPSS solely on KT we are able to report separately on collaborative R&D oriented towards KT and collaborative R&D for the PPARC science programme. The new PRI mechanism which funds industry direct will make funding industry more transparent; sub-contracting through grants to HEIs meant that PPARC did not readily have access to all the information.

22. We will continue to measure the value of collaborative research supported through PIPSS and outcomes through final reports.

Training

23. Since a high proportion of PPARC PhD students enter a career in industry and employers value their skills it is felt inappropriate to consider only collaborative schemes such as CASE and CASE Plus when considering knowledge transfer. Instead we will focus on the wider cohort of PhDs. The introduction of formal Performance Management has led PPARC to commit to regular repeat career path surveys (the next due in 2008) and to include an additional assessment of employer satisfaction.

Commercialisation

24. PPARC will continue to review its involvement and investment in a number of activities—many of which are jointly funded (Research Councils' Business Plan Competition, PPARC/RSE Enterprise Fellowships, PPARC Encouraging Enterprise course, RCs Follow-on Fund). It is necessary to adapt with the changing funding scenes in eg RDAs. PPARC will continue to follow up the outcomes on the percentage leading to spin out and licensing.

People Exchange

25. PPARC will continue to measure its investment in the programme of brokering events and to analyse attendance at these events and evaluation questionnaires. PPARC will apply more rigour in tracking subsequent funding applications. PPARC will also continue to monitor funding through schemes such as KTP, Discipline Hopper—both total investment and outcomes through final reports.

Other industrial interaction

26. PPARC will measure UK contract return through the UK Industrial Liaison Officer for CERN and also ESA and ESO using appropriate PPARC staff contacts. We are doing this already but will want to collect data in a more uniform way where possible using common timeframes, currencies etc.

FUNDING

New OST funding

27. PPARC is using the new funding awarded by OST in the Spending Review to enhance specific elements of the programme. The capacity building funds are contributing to the expansion of the brokering programme. The funds for KT and interaction with industry are being applied equally to the KT and technology development funding lines with the aim of increasing the number of KT collaborations with industry and increasing the direct funding to industry for technology development for the PPARC programme.

<i>Activity</i>	<i>2005–06</i>	<i>2006–07</i>	<i>2007–08</i>
PIPSS/other KT	1,549	2,017	2,051
Programme Technology Development*	250	849	987
Commercialisation	61	69	75
Brokering	344	512	522
Funded by:			
Baseline	2,204	2,404	2,592
OST additional award		1,043	1,043
TOTAL	2,204	3,447	3,635

*to be supplemented with funding from the grants line rising to > £2 million.

APPENDIX 3

Memorandum from Dr Dan Cornford, Aston University

KTP INQUIRY

1. I thought I would just share with you my experiences, positive and negative, of taking part in a Knowledge Transfer Partnership (KTP) programme. So far in my six year academic career I have completed one KTP (it was called a Teaching Company Scheme at the time), and am currently working on two others.

2. All the projects I have been involved with have been in the software development sector, with SME's, indeed the first programme was so successful that it helped generate the two I am currently working on, with two related companies.

3. On the whole, my experiences of the projects has been very positive. I feel I have gained a lot of real world experience which has helped me in my academic career, for example one of the companies we have been working with was part of an EU Framework 6 STREP proposal we recently submitted. I think the companies have gained in several ways.

4. For the companies that main benefits I perceive are:

1. Ability to use the academics contacts to assist in recruiting the best students.
2. The academics act as consultants for companies giving them a truly independent perspective.
3. The academics bring a range of skills which can give the companies a real boost in their ability to innovate.
4. The KTP time acts to provide a ring fenced time within the company for thinking more strategically.

5. For the academics the main benefits I perceive are:

1. A chance to apply our ideas to real problems.
2. Money that is able to then support other research / activities, and counts for the Research Assessment Exercise.
3. A break from teaching and research with relatively low pressure on us.
4. Contacts within industry.
5. Case studies, guest lecturers and real relevance to teaching if the modules and KTPs overlap.

6. One of the surprises I have found in undertaking KTPs is the lack of expertise in even small "technical" companies with regards to cutting edge technology, but also the underlying mathematics that underpins much of the work they do (I have worked largely in spatial/geographical information systems related projects, and I am occasionally amazed by the lack of knowledge in some key areas, mainly maths related). Having said that I have been impressed with the very progressive and open approach that the companies take to the KTPs, and the vision that they are capable of, given the risks involved. I now appreciate far better the problems of running small businesses!

7. I have two concerns about the running of the KTPs however. One relates to the NVQ training that is a compulsory part of the programme. In some cases this might be useful, for example in management or advertising type projects, but for highly technical projects such as the ones I have been involved with, the conclusion of the KTP associates is universally negative. The NVQ level 3 in management is seen as a series of hoops to jump through, and adds no real value to the programme. I would like to see more selective use of such processes. We would rather the associates spent their time pursuing a higher degree; the NVQ almost precludes this, since they would have to work far too many hours to achieve both.

8. My other concern relates to what happens when the KTP ends. The issue here is largely time (and thus money!). Once the funding stops, the associate either joins the company or moves on. The company may then revert to old practices (this certainly happened in the first KTP I undertook) and no longer communicates with the academics (this is also our fault—both parties are too busy—without the structure of the KTP to ensure regular meetings things drift again). Although I do still have very occasional contacts with the company (the KTP ended almost two years ago now), it is very hard to make the time, from both sides. Now maybe this reflects badly on me, and the company, but I wonder whether some form of post KTP support could be envisaged, since once there is money involved the university managers will be far happier to see us use our time on such support. I am not sure I know a good solution here, but I feel it is an issue that should be addressed. I bet that many KTP based relationships end once the money runs out.

9. This is not meant to be negative however, because I really believe that in the KTPs I have been involved with we have helped to (are helping) make the UK more competitive and this is something that I personally value highly as an achievement. KTPs are a great route to facilitate this—I am sure you would get the same response from the managers of all the companies I have worked with on KTPs. They represent excellent value to the company, provide money for the academics involved and I would hope end up netting the government a profit due to increased profits and thus taxes. I think if I were in charge of funding for higher education I would certainly look at increasing the number of KTPs, particularly for SMEs. They represent

a really good opportunity to transfer technology, although for my money I would focus more on technical projects and less on management / advertising type projects. I think that most projects I know of have been successes.

I hope this helps you in your review, and sorry if it is a little personal in parts!

December 2005

APPENDIX 4

Memorandum from Astra Zeneca

1. RESEARCH COUNCIL SUPPORT FOR KNOWLEDGE TRANSFER

2. AstraZeneca is a global company engaged in the discovery and development of new medicines for the treatment of infections including tuberculosis, cancer, metabolic disorders, cardiovascular disease, neuropsychological, gastrointestinal, respiratory and inflammatory disorders. Our innovative products bring benefit to patients throughout the world.

3. AstraZeneca is pleased to contribute to this inquiry. As a successful major pharmaceutical company AstraZeneca enjoys wide ranging interactions with universities world-wide. Partnerships with universities are an essential component of AstraZeneca's research and development activities and as such are greatly valued for three major reasons:

- to further AstraZeneca's research objectives;
- to develop networks with academics to facilitate knowledge exchange;
- to support the training and education of skilled scientists and clinicians who might also contribute to AstraZeneca's business as future employees.

EXECUTIVE SUMMARY

4. We are encouraged by the allocation of £2.2 billion to the Research Councils from the Science Budget by the Office of Science and Technology (Ref 1. figures for 2004–05). It is important that such funding is channelled into world-class research that brings positive benefit to the UK science base. This coupled with effective knowledge transfer systems with industry and public services, leading to innovative products, as well as improved management and motivation, should result in benefit to the UK economy as a whole.

5. The amount of the total budget that is dedicated to Knowledge Transfer (KT) is not transparent. We find it difficult to obtain figures from each research council for its own spend on KT. The current allocation of £79 million (Ref 1. figures for 2004–05), largely delivered through HEIF, whilst not insignificant, only represents a small fraction of the total budget allocation. We very strongly believe that the proportion of funding on KT should be increased. The value of the total research investment made by the OST will not be realised unless KT is highly promoted, rigorously pursued and adequately funded.

6. Research Council funded projects in universities require more stringent project planning and project management than is the situation today in order to ensure that money is not wasted and potentially exploitable ideas and discoveries are not left undeveloped.

7. Evidence of robust timelines and clear success criteria for projects must be developed if we are to derive maximum economic benefit from the investment in research in the UK. Furthermore, performance metrics must be drawn up that can be the basis for incentives/rewards and that emphasise that quality exploitation and KT endpoints are more important than quantity outputs.

8. The Research Councils play a critical role in the development of the knowledge economy and science base in the UK. It is, therefore, vital that the Research Councils continue to develop partnerships with industry and universities and critically important to do more to ensure the visibility of such schemes in the user community.

9. Continuous supply of skilled scientists and engineers is a major concern to employers. Consequently the provision of excellent research training in science, technology, engineering and mathematics by the Research Councils is critically important. It is imperative that Research Councils, RC UK and employers work in partnership to ensure delivery of world-class, relevant, STEM research training and skills base improvement.

10. One of the most powerful ways to transfer knowledge is through the transfer of people. We suggest that the Research Councils encourage universities to participate in interchange programmes between university and industry at the fellowship level to supplement the excellent CASE award post-graduate training schemes.

11. Additional benefit could also accrue from raising the profile of current beneficial schemes. Furthermore, the Research Councils should consider ways to increase the flexibility of the various CASE schemes that exist.

12. We commend the Research Councils' open and consultative approach to the development of Knowledge Transfer. We suggest that, identifying the appropriate user community and continually engaging in discussion and debate of any new schemes, will ensure that they are fit for purpose with concomitant benefit to the UK as a whole.

13. We recognise the extensive nature of the science supported by the Research Councils. It is important to focus on strategic activities for the UK, building on strengths and sharing best practice both within the Research Councils under the auspices of RC UK and also internationally.

PROMOTION OF COLLABORATIVE WORKING BETWEEN RESEARCHERS AND PARTNERS IN INDUSTRY, INCLUDING IN THE CREATIVE INDUSTRIES AND SME'S

14. The routes for promoting collaborative working between Research Councils and industry appear to function reasonably well in some instances. At various levels in our organisation and at different interfaces, AstraZeneca is engaged in dialogue with the Research Councils. The interface between Research Councils and Universities and Industry is less obvious. This suggests to us that more should be done to define and develop this tripartite interface.

15. In order to ensure that science training and research in the UK remains excellent it is paramount that the Research Councils market and promote collaborative working more effectively than they do at present. By taking into account the views of their customer communities, the Research Councils can capitalise on the investment made by Government.

16. Collectively, the Research Councils operate a number of research training schemes such as the CASE scheme, Doctoral Training Accounts and Masters training that have brought significant benefits to all parties in terms of quality of research project and training, experience of working in an industrial environment and promoting links between academia and industry. It is our very strong view that such schemes receive long term funding. Although we recognise that pump priming may have a role in some instances, research training and skills development in STEM should be a strategic activity and not supported on a short term financial basis. The EPSRC support for collaborative training accounts including a Masters Training package was strongly welcomed by AstraZeneca as it provided a means by which we could target training to our key skills areas, such as the MSc course in Statistics with Application in Medicine at Southampton University. We are concerned that due to a lack of effective dialogue between stakeholders, courses, such as the one at Southampton, that is considered to by industry to be very valuable, may be lost due to lack of long-term financial provision.

17. Where the Research Councils have provided a framework for industry and universities to work together in schemes such as LINK, this has fostered collaborative research activity.

18. It is important that the Research Councils continue to develop partnerships with industry and universities and critically important to enhance the prominence of such schemes in the user community. Some of the current schemes are not widely known or understood in some user communities. We would like the Research Councils to do more to increase the emphasis of current beneficial schemes such as the CASE studentships.

19. We strongly urge the Research Councils and RC UK to support and promote more vigorously interchange programmes between university and industry particularly at the Fellowship level. Another suggestion would be to target newly qualified research scientists and specify that Research Council supported individuals should consider spending their first year in industry. This would not be a trivial undertaking, but one well worth pursuing. We welcome the new BBSRC industry interchange programme as this appears to encompass a degree of flexibility in design and has taken into account some of the needs of the stakeholders. However, as we were not engaged in the development of the scheme so we find ourselves poorly prepared to participate in the initial application process. We also find the EPSRC Research Assistant Industrial Secondments very useful.

20. We recognise that our needs for students are variable. We place some studentships in strategically important skill areas and others in projects of critical scientific interest. We suggest that the Research Councils show greater flexibility in both the number and type of CASE students that can be allocated to industry. Furthermore, industry and the Research Councils should continue to build on the strength of their relationship in this area and target CASE awards and Doctoral Training Accounts to strategic areas.

21. The recent report from the ABPI—Sustaining the Skill Pipeline (Ref 2) recommends a role for the Research Councils and RC UK in the development of strategic skills. We suggest that the focus should be on the establishment of training centres at Universities for particular skills such as pathology, safety pharmacology, mathematics and statistics in experimental biology and clinical research.

22. The additional funding from OST of £2.5 million to the Research Councils for knowledge transfer (KT) activities in 2006–07 and 2007–08 and the expectation of comparable funding from the RDAs is welcomed. Nevertheless, it remains important that the Research Councils and RDAs seek to maximise the benefit of this funding for the benefit of the UK economy and do not feel constrained, by geography, to fund the best science. It is also important to recognise that all the RDAs are not equal in terms of their ability to accept and utilise the various forms of KT and not all will be equally as effective. The NWDA is an exemplar in terms of promoting partnership working. Through the development of the UK Biobank, national biomanufacturing centre and National Institute for Bioinformatics, the RDA has demonstrated significant leadership and management capability. We believe that the Research Councils and RDAs working together can be a powerful catalyst to innovation since the knowledge of centres of scientific excellence reside with the Research Councils and the knowledge of potential user community capability resides largely with the RDAs.

23. In order to help to increase R&D investment in the UK towards the goal of 2.5% it is important to consider the role of the SME community. The growth of the SME pool is expected to create a source for future employment. Only some businesses in this community have the necessary resource and capability to engage in KT. Research training performed in an SME will be very different to that provided by a large organisation. Consequently it is important to target funding towards establishments that can offer good training to high standards. In all instances, quality is key. It should be borne in mind that some SMEs are often under considerable financial pressure and have constraints on research activity. This may result in limited flexibility in terms of opportunity and resource to participate effectively in research training. The Research Councils and RDAs must ensure that the SME has sufficient financial strength to guarantee completion of any Studentship or Fellowship.

24. Technology transfer appears well developed in most of the established Research Councils. The development of the Drug Discovery Group by the MRC appears to be a sound strategy and there are a number of good examples of schemes to promote technology transfer. Provision of Pre-seed corn funding by the Wellcome Trust and seed corn funding by the Rainbow fund should enable ideas to progress towards commercial exploitation and are positive moves. However, whilst evaluation of ideas is reasonable in some universities, it is important that such early projects are well managed. There is a great need to improve the monitoring of ideas and projects in universities that arise from Research Council funding such that valuable opportunities for exploitation of research results are not lost. It is possible to envisage a tiered approach to monitoring methods and project management such that small scale funding is associated with general good management techniques and significant investments by the Research Councils are accompanied by rigorous project management measures.

STAKEHOLDER ENGAGEMENT AND COMMUNICATION

25. AstraZeneca typically interacts with the Research Councils in a variety of ways. We generally meet with representatives of the BBSRC, EPSRC and NERC on an annual basis to discuss research funding priorities, studentships, knowledge transfer and the various Research Council schemes. We respond to consultations and discuss specific issues as they arise. In addition, through our representation on trade organisations namely the ABPI and CBI we have additional opportunities to provide comments on the work of all of the Councils and provide input to any sector-based view.

26. AstraZeneca scientists and clinicians also participate on review panels and committees of the MRC, BBSRC, NERC and EPSRC as well as the Wellcome Trust, RC UK and the Royal Society. AstraZeneca is a recipient of the BBSRC and EPSRC industrial partnership CASE award schemes and is an active partner in research collaborations with BBSRC, MRC, NERC and EPSRC. It is our experience that such direct interaction is the most beneficial way to influence the research supported by the Research Councils in order to ensure that the UK science base remains world-class and that the UK is seen as an attractive place to conduct research. We strongly suggest that NERC move to a position where they can operate an Industrial CASE quota system in the same way as the BBSRC Industrial Partnership CASE scheme. The latter system brings much efficiency and has the time line required to ensure that first class honours students can be identified for projects.

27. NERC has operated an annual KT Announcement of Opportunity against three criteria (1) CONNECT, (2) Good Ideas and (3) Networks. The CONNECT scheme requires 50% funding or support in kind from the stakeholder. These are full submissions and the proposals are graded on science excellence first and KT second. We believe that this is entirely appropriate for the CONNECT scheme. However, it is our view that the Good Idea's and Networks schemes, which are designed to promote stakeholder involvement and communication that will lead to the identification of a future research agenda, should be judged on KT criteria primarily. In these schemes because the science content is under development, it would be expected to score medium to low (A4L or A3) although the KT score can be high (A4H or A5). The scientific content will be developed by the Network or the Good Idea as the project progresses. At present projects with a high KT potential are not being funded because NERC always grade on a "blue sky" science first and foremost. It is our experience that some good networks fail because of this.

28. One outstanding example of stakeholder engagement and collaborative working is the new partnership between the BBSRC, MRC, Higher Education Funding Councils, the British Pharmacological Society and a consortium of pharmaceutical companies (AstraZeneca, GlaxoSmithKline and Pfizer) to establish an £11 million dedicated fund to increase capacity building in integrative mammalian biology. The pharmaceutical sector identified a clear need and also an opportunity for the UK to consolidate and strengthen the training of physiologists and pharmacologists. This partnership is the culmination of dialogue, persistent effort and leadership in order to stem the decline in in vivo science capacity in the UK.

29. Other examples of successful partnership models exist and AstraZeneca has recently entered into an agreement with the EPSRC to develop a Doctoral Training Centre in targeted therapeutics at the University of Nottingham that will provide funding for 25 PhD students.

30. However, we must not become complacent. There are some schemes, such as the Industrial Partnership CASE, that are durable and well valued. Even so, as RCs and organisations such as ours, continue to evolve, there is the need to explore together and to develop new ways of working in partnership. Strong leadership and effective communication will be important aspects of this process.

RESULTS AND PERFORMANCE MANAGEMENT

31. We are encouraged to see performance metrics for a healthy UK science and engineering base and for better exploitation. It is important that the metrics reflect the objectives for each Research Council, are sufficiently stretching and are clearly measurable and transparent to all. In addition, robust metrics are often developed during discussion with stakeholders including the user group and, in this regard, we were pleased to see the RC UK KT external challenge event and be invited to take part in this consultation.

CO-ORDINATION BETWEEN THE COUNCILS AND THE ROLE OF RC UK

32. AstraZeneca welcomed the formation of the RC UK group. One expectation was that such an overarching body would provide leadership and direction to the eight Research Councils. Whilst the mission statement of RC UK is commendable, it is not clear to us what additional value RC UK has delivered to the effectiveness of the research, training and KT activities of the eight RCs. Although RC UK has played a role in bringing together joint schemes such as the Business Plan Competition and the Young Entrepreneurs Scheme, in practice it appears that RCUK acts as little more than facilitator to the eight research councils. At present RC UK exists as a virtual group comprising Council staff from the eight RCs whilst the eight RCs are legal bodies incorporated by royal charter. We suggest that RC UK focus on performing its function to optimise the ways that the eight RCs work together by creating a forum to share best practice across the Research Councils. This will improve efficiency and add value to the operations of the Research Councils.

33. Other areas where AstraZeneca believes that RC UK may wish to consider greater involvement include:

- Development of impact and KT measures for all RCs.
- Development of very transparent assessment criteria against which KT submissions are assessed.
- Publication of success rates for funding in the different schemes.
- Promotion of a common set of schemes (where appropriate) for all research councils, for example the Industrial Partnership CASE scheme.
- Provision of a common entry point for interfacing with RCs.
- Progression to act as a governance and reviewing body with accountability to the OST.

34. We hope that this brief response is helpful to your inquiry into Research Council support for knowledge transfer. We would be pleased to share with you our views in greater detail than this short consultation document allows.

REFERENCES

1. <http://www.ost.gov.uk/research/funding/budget05-08>
2. <http://www.abpi.org.uk/publications/pdfs/2005-STEM-Ed-skills-TF-Report.pdf>

APPENDIX 5

Memorandum from the University of Surrey

The University of Surrey is pleased to submit the following views as evidence to the Select Committee on Science and Technology.

1. GENERAL COMMENTS

Currently there are a number of organisations that are involved in knowledge transfer from the academic sector into commerce and business:

- Research Councils
- HEFCE via the HEIF initiative
- Regional development agencies—various schemes
- DTI
- European Union

It is our view that the approach is fragmented with little, if any, attempt to join up the initiatives. This results in duplication and confusion to the academic sector. There is a need to adopt a national strategy and to fit each of the participant organisations into it so as to achieve gearing and added value.

Within the overall Knowledge Transfer scene (as it is presently interpreted) we would see the research councils playing a small, but well defined role. We do not consider it the major mission of the research councils to generate new business or to play a major part in the near term Research and Development programmes of big business. With limited resources these are best devoted to long term research—the research councils are still the sole source of funding for blue-skies research, and this should be their priority.

We do however see two key areas in which the research councils should play a part. The first of these is to make available to business the knowledge on research results. The second is to work with business to determine the strategic areas of long term research that should be engaged in for future national competitiveness.

2. METHODS OF ENGAGEMENT WITH BUSINESS

There are several methods of engagement used by academia with business as follows:

- *Partnering*
Strategic partnering of key business sectors with academia is to be encouraged. In this respect the research councils have succeeded in collaborations such as; BAe systems, Rolls Royce, Mobile VCE and the Defence Technology Centres.
- *Project based consortia*
The established LINK schemes operated between DTI/EPSRC had limited success. It is perhaps too early to judge the new Technology Platforms that have replaced it, but there is some evidence of the uneasy alliance of the DTI and EPSRC in partnership of the scheme which belied the LINK schemes.
It is our experience that partnerships fostered via the EU Framework programme work much better than UK generated schemes.
- *KTP Schemes*
These work well with SME's and are to be encouraged in this sector. However they do not sit easily with the long-term research agenda as they are more focused at short term and product based R&D.
- *Embedded laboratories*
These schemes have been developed much more in the US than in the UK. At Surrey we are experimenting with a Thales funded laboratory within our new media lab and early evidence is that industrial researchers working alongside academics is providing some real added value. We consider that such schemes should be expanded via the research councils.
- *Sector workshops*
These have been tried by the research councils but perhaps not as pervasively as they might have been. In our view, what is needed is a two-way workshop where industry outlines their problems and academia their research results and future directions. The success in this area has again been with BAe systems in setting up their collaboration with EPSRC and academia. We feel that this could be extended into "sectors" of industry rather than just on a company basis.
- *Joint appointments*
There exist current schemes to allow secondment in both directions but we feel that genuine joint appointments between academia and industry would be a better way of securing the KT needed.

3. NEW AS AGAINST EXISTING BUSINESS

The creation of new business from research has very much been the feature of HEIF schemes that have tended to dominate the academic agenda in the last few years. We do not consider that this is the purview of research councils. To some extent the KT with existing big business has been neglected and this is an area where the research councils can play a part as outlined above.

RDA's tend to focus on networking and specific regional business creation as well as inward investment, and again this is not an area for research councils.

European Union activities in KT have again focussed on regional issues and linkage of similar regions across the Union.

4. FUTURE ROLE OF RESEARCH COUNCILS

We feel that it is vital that research councils do not become too diluted from their primary mission of funding long-term research. There are already many programmes within the research councils involving stakeholders and beneficiaries and it is important that scarce resources are not used to imbalance these research council programmes.

We would support areas to improve dissemination of research knowledge—especially via sector collaborations. We would also support initiatives in pulling together research output across the academic sector to the benefit of business. We would also support improved collaboration between the research councils and business/government in determining key future areas for research and the focussing of resources into these areas.

We do not consider that the research councils should move into areas of KT that are addressed by other organisations. Indeed there needs to be improved synergy between these various organizations.

February 2006

APPENDIX 6

Memorandum from the Applied Research Forum for Farming and Food

RESEARCH COUNCIL SUPPORT FOR KNOWLEDGE TRANSFER

EVIDENCE FROM THE APPLIED RESEARCH FORUM FOR FARMING AND FOOD (LEVY BOARD MEMBERS) RELATING SPECIFICALLY TO THE BBSRC

Summary

The agricultural/horticultural levy bodies, working as the Applied Research Forum, believe that the BBSRC could significantly improve its knowledge transfer in programmes which relate to the agricultural industry. Whilst a number of BBSRC Institutes take working with the industry seriously, this does not appear to be strongly supported by the Council. Effective routes to exploitation for much of the responsive mode work are not evident.

1. The Applied Research Forum for Farming and Food (ARF) has a core membership drawn from the seven agricultural and horticultural levy bodies within the UK. It was established by the levy bodies in response to recommendations by the Policy Commission on Farming and Food.

Knowledge transfer is at the heart of levy body activity, both working separately and together as the Applied Research Forum. We fund applied, and to some extent strategic, research on behalf of our levy payers (sectors of the farming, and in some cases, primary processing, industry) and then transfer the knowledge gained to them through a range of activities and publications.

2. We have links with the BBSRC through a number of routes:

- The BBSRC has a representative on the ARF, along with representatives of Defra and the devolved administrations, the FSA and the farming unions.
- Members of the levy bodies sit on various BBSRC committees/panels.
- Many of the levy bodies have strong links with one or more BBSRC Institute, where we fund research.

3. BBSRC funds agricultural and food research:

- through core funding to research institutes, such as Rothamsted Research (RR), the Institute of Grassland and Arable Research (IGER), the Institute for Food Research (IFR), the Roslin Institute (RI) and the John Innes Centre (JIC);
- through responsive mode funding to eg universities and research stations, based primarily on quality of science;

- through initiatives such as the Crop Science Initiative;
- through LINK funding matched by industry, in programmes such as Sustainable Arable LINK, Sustainable Livestock Production LINK and Horticultural LINK. Levy boards are involved in a large number of projects in these programmes and have a major responsibility for KT flowing from them.

4. Some BBSRC institutes are keen to ensure that the science they undertake has practical outcomes that are delivered to the industry. For example, RR and IGER have worked with the ARF in the planning and delivery of workshops on soil and agricultural waste management, and are involved in the follow-up to ensure messages get out to farmers. RR has a separate company (Rothamsted Research Association), limited by guarantee, which has a membership largely comprising agronomists and growers. Its function is to make its membership aware of the research RR is undertaking and the implications of it for the industry. Many events are held in conjunction with one or more levy boards and the Lead Technical Director of the ARF is a member of the Board. Broom's Barn, a research station belonging to RR but funded largely by the sugar beet industry through a levy, plays a leading role in the sugar beet industry's KT programme. JIC has strong links with the plant breeding community. IGER has strong links with farmers and others involved in grassland management. However, although many Institute Directors have a commitment to this kind of KT, our understanding that this is not regarded as core activity by BBSRC, who regard IP and start-up companies as of prime importance. Whilst we recognize the value of these activities, these do not provide the primary route for delivering knowledge and technology to the agricultural sector. BBSRC does not seem to recognize that agriculture is a very different industry to others, such as the pharmaceutical industry, which it serves. Although some sectors of agriculture, such as the agricultural chemical industries, have research departments which can feed into basic research, most plant breeding businesses are not well funded, and individual farming businesses need planned routes for delivery.

5. We are also concerned about the "pipeline" for responsive mode research, particularly in the university sector. We feel that much of this is not well focused on industry needs, even in the long term, and there is little consideration of effective routes to exploitation. A defined process of science management, involving stakeholder engagement (including levy bodies), would considerably strengthen the process. Exposure of scientists to the industries which they are trying to serve would be very valuable. When levy bodies have interacted with university programmes, there have been significant benefits for the industry—for example the MLC's work to improve food safety following challenges such as *E. coli* 0157-H7.

February 2006

APPENDIX 7

Memorandum from the Centre for Sustainable Urban and Regional Futures (SURF)

LESSONS FROM:

KNOWLEDGE TRANSFER BETWEEN THE UNIVERSITY AND HEALTH SECTORS: PRODUCTION, TRANSMISSION AND RECEPTION

EXECUTIVE SUMMARY

This submission has been prepared by the Centre for Sustainable Urban and Regional Futures (SURF) based on work conducted for a Strategic Health Authority. Its remit was to examine the dynamics of knowledge transfer (KT) between universities and the health sector, with specific reference to research-based activity.

1. KT is regarded as the transfer of ideas, practices and skills between entities to facilitate and strengthen links between them. Given the idea of the "knowledge economy", KT is seen as essential for economic growth and productivity.

2. Government and funders rigorously claim to support the transfer of knowledge, but face an absence of "know-how" which is not solved by a simple resort to IT solutions.

3. There is a "dearth" of understanding in relation to the "how to" of KT leading to a "missing middle" in its practice.

4. Research activities vary in terms of their scale and scope, from local and regional to national and international, and this affects the form of the KT process.

5. The research-practice relationship is influenced by a number of factors: for example, existing research culture, institutional position, levels of funding and membership of networks.

6. Research processes are shaped by institutional and occupational research cultures and those, in turn, are influenced by sources of funding: in particular, the Research Assessment Exercise (RAE) in universities.

7. There are a significant number of people who regard current funding processes as unfair and the form of assessment for the next RAE is still to be decided. With regard to dissemination, there are differences in emphasis according to what is encouraged within the research culture and the form of funding itself. These differences are important to bear in mind in formulating a strategy for more effective KT.

8. A lack of research funding over time affects research infrastructure, as well as applications for external funding and research strategies. It can also be the cause of fragmentation and directly affects dissemination and the job security of research staff. Good coordination, communication and collaboration are essential for KT to work effectively.

9. All researchers interviewed believed the research process is now inferior to past practices, due to conflicting pressures upon the research process from organisations with different interests. In particular, researchers in institutions with established cultures drew attention to the lack of funds, whilst those in institutions with less established research cultures drew attention to the need to provide developmental funding.

10. Support for KT is not built into normal Research Council funding, whilst institutional incentives and occupational cultures often militate against its effective development.

11. Knowledge must be produced and communicated rather than simply transferred. It must then be actively received, understood, interpreted and acted upon.

12. The reception of research requires more consideration than has been provided thus far. Without some understanding of use in context, KT is an activity without substantial benefit.

SECTION 1: INTRODUCTION

1.1 The objectives of the work upon which this submission is based were to: (a) provide an overview of national-level research strategies in health and social care for the main funding bodies, including Government departments and relevant Research Councils and (b) to inform the development of a better understanding of the research-practice relationship between universities and health and social care organisations in order to contribute to more effective knowledge transfer (KT).

1.2 National-level research strategies have seen an increased emphasis on KT. KT has been associated with university-industry collaboration and clustering and seen as a mechanism through which regions could increase their competitive advantage. Correspondingly, within the health sector there has been an increased emphasis on reducing the research-practice gap via, for example, evidence-based practice, translational research and knowledge management.

1.3 Universities are now required to adopt new roles in relation to the traditional functions of teaching and research and this has led to “reach out” initiatives to local communities, as well as businesses, promoting relevance to societal needs and forming partnerships with a range of agencies.

1.4 Despite the promotion of such activity, there is a dearth of what may be called the “how to” elements of KT. A central purpose of the work was to contribute to a greater understanding of the issues facing researchers within HEIs and health and social care organisations and to provide a platform upon which to build an effective “know how” of a regional knowledge transfer strategy.

1.5 The work was divided into two phases: a literature review—including a web-based review of current policy—and 51 interviews with key actors, including researchers across different disciplines and funders.

1.6 The purpose of the interview stage of the research was to gain a more in-depth understanding of the dynamics of the research-practice process, including research production, dissemination and research impact. Similarities and differences in how research is conducted were discussed and interviewees were asked to reflect on the research-practice process in order to identify those elements that they thought were beneficial or those which they would like to transform. The identification of factors which both enable and constrain the research process provided the basis on which recommendations could be made for the development of a regional KT strategy.

SECTION 2: SUMMARY AND RECOMMENDATIONS

2.1 *The Missing Middle: “How To” in Knowledge Transfer*

2.1.1 It is widely recognised that we now live in a “knowledge economy” where knowledge is key to economic and social development, competitive success and the wealth—and health—of the nation. The role of universities as knowledge producers is increasingly valued and emphasis placed upon their relationships with businesses, governments and society in general. Accordingly, priority is being given to notions of “social robustness”, “relevance”, “user engagement” and “knowledge transfer”. However, there are no simple solutions to making it happen.

2.1.2 Tacit knowledge is embodied and embedded in organisational, institutional and geographical contexts. It represents the culmination of years of professional experience—"knowing in practice". Explicit knowledge can be codified and documented and is essential as a basis for information-sharing and accessibility. In a knowledge economy, both forms of knowledge are vital, particularly if knowledge is to be not only transferred, but also understood and used in practice.

2.1.3 We now face increasingly complex relationships between researchers, policy-makers and practitioners requiring new methods of working, interacting, producing and disseminating research. Policy-makers and researchers alike are still getting to grips with what new knowledge production processes mean for doing KT.

2.1.4 A review of Government policy highlights the missing "how-to" of KT. Government departments all state an increased importance attached to KT, but this is generally seen in narrow terms, relating predominately to university-business interactions rather than relationships with, for example, the health, local government or voluntary sectors. As a result, many other forms of knowledge, vital not only for wealth creation but also social benefit, are omitted from consideration.

2.1.5 In terms of Research Councils, allocation of funding to KT activities is often difficult to determine. Projects tend to focus on licensing, commercialising research, protecting intellectual property (IP) and the creation of spin-out or start-up companies. Some indications of innovative practices do appear, for example, in the transfer of "embodied" knowledge via fellowships in Government departments or in seminars, such as the ESRC "Getting Research Into Practice" events.

2.1.6 None of the Government departments or research funders provide clear advice on "how to" undertake effective KT and exhibit a tendency to oversimplify the process.

2.2 *Research in Practice*

2.2.1 Reasons given for fragmented KT in practice include: non joined-up funding streams; constant and time-consuming organisational change; inadequate institutional support; job insecurity; a lack of awareness of opportunities; an absence of clear and consistent mechanisms and limited understandings of what is meant by "research" itself.

2.2.2 Good research cultures are a necessary condition for effective KT and depend upon the retention of good research staff whose knowledge and skills are at a premium. Yet this is difficult to achieve with funding streams that are both short-term and reactive. The source and volume of funding is core to understanding research production and transmission. Current methods of funding allocation are contentious and often work to undermine good work that takes place at different scales of activity (local; city-regional; regional; national and international).

2.2.3 There is no commonly agreed definition of KT within or between sectors. There are many activities which have similar purposes and outcomes, but which are defined differently. Views on KT are also narrow with a high value placed on articles in peer-reviewed journals and low expectations of research outputs. This results from the configuration of current cultures of inquiry in which the RAE can work to militate against innovative practices.

2.2.4 Funders of research have little involvement in the research process and mechanisms for evaluation and feedback to researchers are limited. At the same time, funders do not build in sufficient costings for dissemination activities that might change such innovative practices and effective institutional divisions of labour are not geared up to such expectations.

2.2.5 Partnerships and collaborations do exist that work effectively and there is a clear need to develop these in mutually beneficial ways and learn from them for wider benefit. Those partnerships that are successful tend to be based on a prior identification of mutual interest, as well as necessity and informal social ties.

2.2.6 Even where KT takes place, an absence of cultures of knowledge reception and learning reduces its effectiveness. The extent to which positive cultures of reception exist is determined to a large degree on funding streams which in turn affects infrastructural organisation and support provision. Organisations must see knowledge as valuable to practice and provide time for its consideration as a precondition for effective KT.

2.2.7 Both cultures of knowledge production and reception need to be better understood in order for KT to be effective. Understandably, Research Councils tend to focus upon the production, not reception side of the process.

2.2.8 New forms of Research Council support are required that take account of the transmission and reception of knowledge. Knowledge must be received and acted upon, not just transferred, with due consideration given to the necessary changes in organisational contexts for knowledge to be effectively deployed.

2.3 *Research in Universities*

2.3.1 KT processes are influenced by institutional and cultural contexts. Prime among these are sources of funding which have clear influences on the nature of activity. Some academics clearly benefited from the RAE and that enabled the funding of research infrastructures. Others felt that the RAE stifled research and downgraded local and regionally relevant activities in favour of the more abstract idea of international excellence.

2.3.2 Depending upon the area of expertise, funding derives from very different sources at different levels of scale from local, through regional to national and international. Lack of success from the RAE and Research Councils causes resentment amongst researchers and was also felt to undermine collaboration and beneficial development.

2.3.3 Funding plays a key role in influencing methods of dissemination. The dominance of the RAE explains the high priority attached to traditional methods of KT through peer-reviewed journals. Less importance was attached to more interactive relationships between the funders, producers and users of research. A very narrow idea of KT predominates.

2.3.4 The idea of measuring research impact or influence is also problematic and varies according to the context in which the research itself is, or is not, taken up. Research impact is often seen to relate to the quality of journal articles, place of publication or number of citations or else seen as irrelevant and not the responsibility of individual researchers.

2.3.5 Funders control much of what enters the public domain, as do the editorial decisions of journals and the companies that own them. It should also be noted that only successful research is often reported because research activity is also about the status of the researcher in their community. Yet much can be learnt from so-called failure, as well as success.

2.3.6 Culture, context, track record and likely sources of funding all inform the direction of research. There is variation both within and between institutions in terms of research intensive practices. Funding concentrates in centres of excellence and this has a self-reinforcing dynamic and influences institutional hierarchies, staff movements, retention of personnel, as well as the relative ease of establishing new research areas.

2.3.7 Other considerations are also important to the research and KT process, including degrees of job security, short-term contract versus longer term systematic work, the time-consuming nature of ethical approval systems, issues of internal communication and institutional support and the teaching/research balance.

2.3.8 Differences in KT practices vary according to disciplinary, as well as institutional and cultural contexts. For instance, a clear difference emerges between the fields of biosciences and genomics and social care research. The former is largely characterized by a one-way, linear and “arms-length” KT process, where publication in peer-reviewed journals is valued, despite the recognition that this is not particularly “user-friendly”.

2.3.9 User involvement also varies according to the disciplinary field and institutional context in which the research is conducted. Similarly, it was noted that collaboration between institutions and researchers is variable according to disciplinary area, with greater competition for large-scale Research Council funding tending to act to the detriment of partnerships.

2.3.10 Differences are clearly related to those factors identified previously, namely funding amounts, funding sources, and length of contracts, methodologies deployed, roles of academics and new versus established areas of research. The opportunities for a meaningful KT process are heightened or diminished according to particular cultures of inquiry, as well as the institutional conditions in which knowledge is produced.

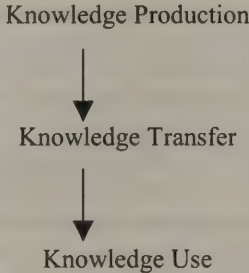
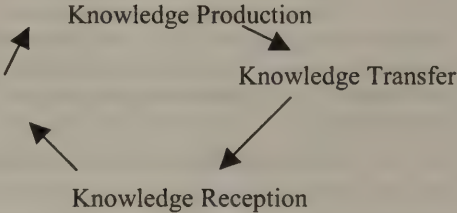
2.4 *Effective Knowledge Transfer in Action—The “Missing Middle”*

2.4.1 Knowledge transfer is not a one-way process (see Table 1). It does not have a clear start and end point or fixed boundaries between funders, users and producers of research. It is about the translation of work from information to intelligence according to the needs, in context, of particular groups of policy-makers, practitioners and the public at large.

2.4.2 KT is not the ‘dull thud’ of a report at the end of the research period. The product of research is only as good as the process that has informed its production. This means a continuous relationship between research participants and interactive user involvement in which differences in divisions of labour are recognised and negotiated. KT is not a hypodermic process that involves the injection of knowledge into recipients.

2.4.3 KT is complex and needs active commitment, work and institutional support to be effective in ensuring that good research feeds into practices. There are no short-cuts or simple remedies. Demanding changes at one end of the research spectrum is not a solution for the credibility of research, which can easily be undermined by demanding that it is immediately applicable.

Table 1
KNOWLEDGE AND ITS TRANSFER

Traditional Mode	Emerging Mode
Knowledge is driven by individual and professional interests	Problems are defined and set jointly by stakeholders
Knowledge is produced by academics and then transferred in a linear process to ‘users’	Knowledge is co-produced with continuous and interactive relationships between producers and funders and users
Knowledge tends to be codified	Knowledge is communicated and it is recognised also to be tacit, embedded and embodied
Dominant methods of knowledge transfer tends to include report writing, articles, etc	There are varied mechanisms for knowledge transfer which include presentations, seminars, placements, job-sharing, workshops, multi-media etc
Knowledge provides information to funders and users that can be stored, retrieved and referred to	Knowledge is also stored by also retrieved according to intelligence that is then incorporated into organisational cultures and practices
Knowledge transfer is passive, contained and static	Knowledge transfer is active, fluid and dynamic
	

(Source, authors, drawing on previous work)

2.4.4 Much research becomes of importance only after time because its value is seen in a different context according to a different purpose. Equally, there is a great deal that can be done to render current research of far greater applicability and value. This process should be informed by the changing role of knowledges in society according to the needs of different stakeholders and communities.

2.4.5 Key to effective KT is an understanding of cultures of inquiry and cultures of reception. Knowledge must be produced and communicated rather than simply transferred. It must then be actively received, understood, interpreted and acted upon.

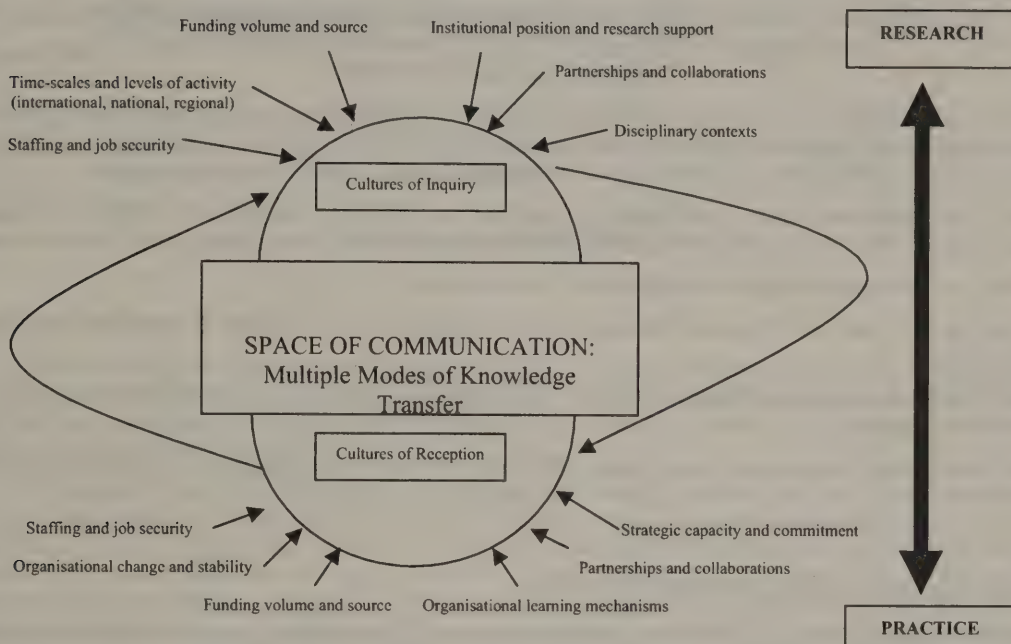
2.4.6 The reception of research requires more consideration than has been provided thus far. Without some understanding of use in context—which is not a one-way relationship of research to practice, but also of practice informing research—KT is an activity without substantial benefit.

2.4.7 Core constraints on the KT process have been identified. These relate to: funding sources, volumes and expectations; staff recruitment, retention and skills; institutional support and divisions of labour; infrastructure enabling development and the building of capacity; the implications of deploying different methodologies; issues of scale in knowledge production; degrees of partnership and collaboration and the embeddedness of organisational learning mechanisms.

2.4.8 If KT is to be effective, it needs to be taken seriously. This means recognising that there is no single model that can be applied to ensure that good research leads to improved practice. A key issue is improving both cultures of inquiry and cultures of reception in relation to KT and appreciating that context-sensitivity is central (see Figure 1).

Figure 1

TOWARDS A CONTEXT-SENSITIVE FRAMEWORK FOR KT



2.4.9 KT does not take place between two separate spheres of activity, but is a space of communication where different cultures of inquiry and reception can engage. Importantly, this framework also points to a continued degree of independence between research and practice or “zones of non-interference”.

2.4.10 The “missing middle” in KT is the expectations placed upon all stakeholders in research without a mutual understanding being developed. Whilst this framework can be seen in action more clearly in certain fields of research, this should not be overstated. Different methods of KT continue to co-exist. What is important in moving forward is an understanding of what methods of KT work in different contexts, for different forms of knowledge and to meet particular objectives and at what time periods. There is no single model or one size fits all solution to KT.

2.4.11 An effective KT strategy is needed that is meaningful at different levels (local, regional, national and international), using realistic time-scales, of what will be achieved and by when.

2.4.12 An effective strategy cannot be simply imposed through, for example, Research Councils, but must also be “bottom up” and continually address questions such as: what should be transferred, by whom, how and with what intended effects?

2.4.13 “Knowledge intermediaries” are needed to add value to existing activities, identify spin-out opportunities that are not normally part of everyday practices and add to those in significant ways. Knowledge should be transmitted and deployed in a way that is useful to clients and this includes non-codified knowledge. A precondition for this is to provide practical help to address those limitations and barriers in current cultures of inquiry and reception that hinder KT.

2.4.14 There needs to be promotion and incentives for HEIs and organisations undertaking and funding research to work more systematically together in order to learn from each other. This means that institutional reward and incentive structures will need examination in the light of such expectations.

APPENDIX 8

Memorandum from the Medical Research Council Trade Union Side

PROMOTION OF COLLABORATIVE WORKING BETWEEN RESEARCHERS AND PARTNERS IN INDUSTRY, INCLUDING IN THE CREATIVE INDUSTRIES AND IN SMES

As a research body, one of MRC's strengths is its very pro-active stance on the identification, protection and exploitation of intellectual property developed in its institutes and units. It encourages its scientists to be involved in a wide variety of interactions including PhD sponsorships and consultancies.

MRC facilitates researchers' involvement in start-up and SME companies, both "MRC" companies based on MRC IP and non MRC companies, by permitting personal consultancies to be held by its staff.

MRC has or is negotiating partnerships with Wellcome and CRUK/CRT.

Training to Career development fellows includes presentations from MRCT and local Technology Transfer Staff.

MRC seeks to capture all visitor developed IP, where appropriate, thus ensuring security of all IP developed in house.

We believe that these commitments place MRC at the forefront of collaborative working, ahead of Universities.

STAKEHOLDER ENGAGEMENT AND COMMUNICATION

MRC is making substantial progress in its interactions with other bodies and public. Information about MRC interactions is available on the MRC website at www.mrc.ac.uk, for example a brief description of activities is given its document.

Key Facts 2005 (www.mrc.ac.uk/pdf-mrc—key—facts.pdf)

RESULTS AND PERFORMANCE MANAGEMENT

The Medical Research Council's policy is to seek to own and control all such intellectual property developed by its employees and visitors to its premises and where appropriate to exploit this commercially by the most appropriate route. To this end the MRC has its own group of technology transfer experts in the form of "MRC Technology" a company affiliated to MRC with charitable status (see <http://www.mrc technology.org/>). The MRC's record in commercial exploitation through MRC Technology is outstanding. This has been achieved through investment in a formerly in-house technology transfer capability now operating as MRC Technology. MRC start-ups continue to flourish and many are well known in the biotechnology sector. These, and the setting up of the UK Medical Ventures Fund/MVM Ltd, with substantial initial venture capital raised externally from the private sector, on the strength of MRC's scientific reputation, are models of best practice recognised in the National Audit Office Report on "Delivering the Commercialisation of Public Sector Science" in 2002, indeed incomes derived from exploitation in 2003 were comparable to those received by the entire UK University sector (UK Universities: £17.12, MRC: £14.18 in 2003 source UNICO Survey 2003) and have continued to grow.

This has resulted in significant incomes to the Commercial Fund enabling MRC to fully resource a new MRCT initiative, the drug discovery group, to take advantage of the MRC's cutting edge biology and generate potent lead compounds for progression to novel drug candidates and attract an excellent calibre of staff.

As a funding body, MRC grants terms and conditions allow recipients of its grants to own and manage the IP arising from MRC funded projects. This allows recipient institutions the fullest freedom to manage and exploit their own portfolios of IP.

There is Regional Centre expertise/contact points in addition to MRCT IP staff. In major centres this expertise is embodied in Contracts Managers and other senior administrative staff who work closely with MRCT colleagues. A recognised weakness is the lack of ongoing training for few regional/unit based administrative staff (2/3) compared with similar posts in the university sector, for example. This could be addressed and co-ordinated with MRCT, through AURIS.

As an incentive to MRC scientists and units, and to encourage their maximum involvement in the exploitation process, the MRC operates the Awards to Inventors Scheme (ATI). In principle the idea of the scheme is to reward, financially, those involved in the development of a commercially viable technology. Payments are based on gross income not net on a sliding scale based on income and Directors have discretion in how inventors shares are distributed but can include "contributors" and not just those named on patents.

CO-ORDINATION BETWEEN COUNCILS AND RCUK

MRC has well established policy and mechanisms for effective knowledge transfer, in which it has been highly successful. The management of these needs to be direct and reflect the needs of the groups concerned and while better communication between RCs is always desirable, such efforts should not undermine or delay individual RC's from working in the best possible way for their business.

February 2006

APPENDIX 9

Memorandum from GlaxoSmithKline

EXECUTIVE SUMMARY

1. GSK interacts with the majority of the Research Councils in an individual capacity. We are engaged in a wide range of schemes including the BBSRC's Industrial Partnership Awards, the EPSRC/GSK chemistry array scheme and the programme supported by MRC and others at the University of Dundee Protein Phosphorylation Unit (PPU).

2. The Research Councils perform their interactions with industry positively and they are all keen to work with business to promote knowledge transfer. All of the Councils are entrepreneurial in their approach to knowledge transfer. We do feel however that there is a need for best practice to be identified and disseminated more effectively across the Councils. The informality and general lack of bureaucracy associated with our industry's interaction with the Research Councils on knowledge transfer issues should not be underestimated as a factor that influences investment decisions. We suggest that the Research Councils need to be more proactive in influencing the work of the Regional Development Agencies.

INTRODUCTION TO GSK

3. The pharmaceutical industry makes a significant contribution to the health and wealth of UK citizens by employing and developing highly skilled workforces, investment in research and development, healthy working populations, efficiencies in healthcare system, and exports to the rest of the world. In the UK alone, the pharmaceutical industry contributes over £3 billion a year to research and development and employs over 80,000 people in R&D, manufacturing and other related activities.

4. GSK is one of the world's leading research-based pharmaceutical and healthcare companies. The company's mission is to improve the quality of human life by enabling people to do more, feel better and live longer. We are involved in the research, development, manufacture and commercialisation of prescription pharmaceuticals, vaccines, over-the-counter medicines, and health-related consumer products.

5. In 2004, GSK invested £2.8 billion in R&D globally and the UK benefited from £1.1 billion of this, making us the single largest private sector funder of R&D in the UK. Globally, our R&D organisation employs almost 15,000 people, with nearly 6,000 of those employed in the UK, where we have nine R&D sites. Collaborative research plays a key role in this investment with GSK engaging in multiple partnerships and knowledge transfer activities with a variety of academic and industry partnerships. We support more than 300 post-graduate studentships in UK institutions and universities.

6. GSK's continued investment in the UK will depend on the quality of the graduates and postgraduates and upon the maintenance of the quality of the basic research carried out in the many universities with which we collaborate. The UK science base is strong; however, scope exists to improve its quality, particularly in light of the increasingly mobile nature of investment by the sector. It is therefore in the best interests of all stakeholders—patients, researchers, government and industry—that the science and technology skills available to the pharmaceutical industry in the UK remain strong and knowledge transfer is critical to this.

SCOPE OF THE CURRENT INQUIRY

7. GSK welcomes the Science and Technology Committee's Inquiry into the Research Councils' Support for Knowledge Transfer and would hope that one outcome of this current review will be the spreading of best practice across the Councils. There is an increasing recognition in the UK of the need to ensure increased professionalism of knowledge transfer and third stream competencies. The Research Councils are contributing in a positive manner to this goal. Recognising the importance of this activity, GSK also provides considerable support in this area to expedite some of the recommendations arising from the Lambert Review. For example, GSK have been intimately involved in the development of "boilerplate agreements" for collaboration between higher education and industry and have contributed to training university Industrial Liaison officers through organisations such as Praxis.

8. GSK notes that the inquiry will focus upon the effectiveness of the Research Councils' knowledge transfer activities, in particular with respect to:

- Promotion of collaborative working between researchers and partners in industry, including in the creative industries and in SMEs;
- Stakeholder engagement and communication;
- Results and performance management; and
- Co-ordination between the Councils and the role of the Research Councils UK (RCUK).

This submission focuses on identifying areas of good practice in the Research Council's knowledge transfer and technology transfer activities.

GSK INTERACTION WITH THE RESEARCH COUNCILS: STAKEHOLDER ENGAGEMENT AND COMMUNICATION

9. GSK interacts with most of the Research Councils, primarily the Biotechnology & Biological Sciences Research Council (BBSRC), the Engineering & Physical Sciences Research Council (EPSRC), the Medical Research Council (MRC) and to a lesser extent the Particle Physics & Astronomy Research Council (PPARC) and the Economic & Social Research Council (ESRC). Within the MRC GSK works closely with MRC Technology, the staff of which we consider take a very professional approach to technology transfer.

10. The Research Councils perform their interactions with industry positively and are keen to work with business to promote knowledge transfer. All of the Councils are entrepreneurial in their knowledge transfer activities and recognise that a common approach does not reflect the needs in all cases. There are some excellent working practices in each of the individual Councils. However, despite RCUK's work with the Councils to promote and share such activities and the fact that the Research Councils are working more closely together than previously, there remains room for improvement in some areas. Unfortunately, pressure on the individual Research Councils to compete for the budget allocated under the Spending Review may inhibit useful collaboration.

11. The majority of GSK's interactions on knowledge transfer issues with the Research Councils take place with each of the Councils on an individual basis. Our ability to interact with all of the Councils in a collective manner, through RCUK, for example on the promotion of good practice, is somewhat limited. RCUK does not appear to be particularly proactive in seeking input from industry.

12. GSK's interactions with the Research Councils occur either directly or through broader industry stakeholder meetings through trade associations, such as the Association of the British Pharmaceutical Industry, BioIndustry Association or the Confederation of British Industries, or through professional bodies, such as the Royal Society of Chemistry. GSK also has the opportunity to put forward our views through our membership of the Councils of MRC and BBSRC and through company representation on a number of specialist committees and panels. GSK also chairs the Bioscience for Industry Strategy Panel for BBSRC.

13. The nature of the interaction between the Research Councils and industry is unique to the UK science base. We suggest that this, coupled with the quality of the research carried out in the UK, is a major factor in influencing the location of research funding. The ability that industry has in the UK, for example, to discuss, with minimum bureaucracy, issues such as potential partnerships to co-fund part of the science base with other funders of research, is envied in other countries. Such informal discussions can often lead to projects to develop part of a skills base or indeed to collaborate on an emerging technology area.

14. There is no doubt that the Research Councils are supportive of the needs of technology-based companies which share their objectives: promoting collaborative research, supporting training and education, stimulating knowledge transfer through the movement of people, and the effective and equitable commercialisation of research. It is critical that the Research Councils support a balanced portfolio of science funding activities. Such funding managed through the Research Councils should support the whole spectrum of research which underpins the UK science base, from "blue skies research" through to more applied research.

15. GSK welcomes the Research Councils' active solicitation of industry's views when setting their research priorities as we consider that technology in industry is further advanced than that in academia. Input from industrial science can and does feed into and help catalyse some of the academic science funded by the Research Councils.

EFFECTIVE RESEARCH COUNCIL SUPPORT FOR KNOWLEDGE TRANSFER AND UK SKILLS NEEDS

16. Below are some examples of where Research Councils have acted to support both knowledge transfer and the UK's skills needs:

16.1 *Co-operative Awards in Science & Engineering (CASE)*

GSK is participating in several schemes in which the Research Council and GSK co-sponsor CASE studentships where the PhD student spends at least three months working in industry. GSK currently co-sponsors around 100 studentships with both BBSRC and EPSRC and 25 studentships with MRC. These programmes expose students to research in an industrial environment and give industry an opportunity to assess the student for future potential employment. These schemes are an excellent way for the company's scientists to forge links with academic supervisors and it often results in follow up funding with the academic. Industry, the student, the academic and the university all benefit from the CASE experience.

16.2 *BBSRC Bioscience Business Plan Competition*

GSK was involved in peer reviewing the business plans for this competition and were impressed with the approach taken in organising this event, including providing a mentoring service and co-ordinating professional groups of lawyers, patent agents and venture capitalists to advise fledgling businesses. Some of these businesses, such as Neurosolutions which won a BBSRC award in 2002, have now developed to the stage where companies like GSK use their services or products. GSK has, for example, placed 11 contracts with Neurosolutions over the last four years worth more than £900,000. The success of the scheme has prompted the Research Councils to join forces and run a combined scheme.

16.3 *EPSRC Array Chemistry scheme: Reactions, Design and Interpretation*

The EPSRC, in partnership with GlaxoSmithKline, recently announced a call for proposals to support a portfolio of activity in the area of array chemistry. Through this single company/single Research Council scheme, GSK chemists will train up to 10 post-docs and 4 PhD students in "State of the Art" chemistry technologies. To ensure that the proposals of the academics have some relevance to current research and training needs in this field, their proposals are discussed with GSK chemists before they are submitted to EPSRC. The successful academics will spend between 50–75% of their time at GSK. They will acquire new skills and then go back to academia to "spread the word" and to apply their newly acquired skills to novel chemical reactions. The whole chemistry science base will benefit as these academics apply their lateral thinking to new chemical problems using modern High-Throughput technologies.

16.4 *BBSRC Industry Interchange Programme (IIP)*

This scheme provides a flexible source of support to enable the interchange of researchers, at any level, between academia and industry. The objectives of the scheme are to increase uptake of BBSRC-funded science by industry and to promote links between the science base and industry. The subsequent transfer of knowledge, expertise and skills occurs "on the hoof" in a bi-directional manner. Academics participating in this scheme gain an enhanced understanding of industries' scientific and training needs which then fosters future academic-industry collaboration.

16.5 *MRC support for the University of Dundee Protein Phosphorylation Unit (PPU)*

The MRC provides long standing support to a centre of excellence within the University of Dundee which focuses on research into kinases and protein phosphorylation. This excellence has also been recognised by industry and six pharmaceutical companies have contributed £15.2 million towards a five year consortium to work in partnership with the MRC and PPU. This world class group have published more than 370 scientific papers of relevance to industrial research over the last five years. The PPU was recently honoured and given a Queens Award to Industry for enabling the discovery of new drugs.

16.6 *BBSRC Modular Training for Industry Programme*

Many areas of science are changing so rapidly that academia struggles to keep pace with their taught modules. A solution being provided by this BBSRC Programme is for industrial and academic scientists to work closely together to develop Continuous Professional Development (CPD) materials of value to industrial scientists. Many of the topics in which work is being done are in rapidly moving fields, such as biomedical imaging, gene-chip production and analysis. Others are in branches of science of value to industry such as anaesthesia use in laboratory animals and developments in psychopharmacology. This BBSRC Modular Training for Industry programme is valuable and GSK would encourage other Research Councils to develop such a scheme.

16.7 BBSRC Industrial Partnership Awards Scheme (IPA)

As a result of universities in the UK now pushing for Full Economic Costs (FEC) from industrial sponsors, irrespective of the in-kind contributions made by companies, increasing benchmarking is taking place as to whether the UK still represents good value in relation to sponsoring academic research. Much of the collaborative research that companies sponsor is very early stage and, recognising this, the Research Councils see the relevance of sharing the risk of funding some early stage research through co-funding schemes. In one such scheme, the BBSRC's Industrial Partnership Awards Scheme, a 10% cash contribution from industry to a responsive mode project gives it additional recognition at the peer review stage. Accordingly IPA projects that are judged to be of appropriate quality would normally be funded in preference to a standard grant of equivalent scientific merit because of the significant user interest demonstrated by the industrial contribution to the cost of the proposed research. This slight uplift encourages the academics to work with industrial scientists, enhancing knowledge transfer further.

KNOWLEDGE TRANSFER ACTIVITIES AND INDUSTRY INVESTMENT. BALANCING THE NEEDS OF LARGER COMPANIES AND SMEs

17. In addition to the commercialisation of our own considerable in-house R&D activities, GSK is increasingly looking to collaborate with innovative SME companies and to identify licensing opportunities for new technologies and potential medicines. GSK seeks such opportunities across the world to strengthen our R&D pipeline. It is therefore important that the UK has a healthy, innovative and sustainable SME biosciences community. The Research Councils have to-date played a strong role in supporting and driving the UK SME sector.

18. In the Government's Ten Year Science & Innovation Framework, it is acknowledged that R&D spending by the private sector in the UK will be increased by:

- Stimulating inward investment of key sectors.
- Maintaining R&D investment by key sectors eg pharmaceuticals.
- Stimulating R&D by SMEs.
- Encouraging those sectors who have not until now carried out much R&D to invest in research.

Research Council policies for knowledge transfer should reflect the need for the UK to be active in all of these four fields. As indicated above, support for SME-targeted activities is essential, but it is positive that the Research Councils are not focusing their activities purely on policies relevant to SMEs and those industry sectors currently not very active in R&D. Such an approach could possibly disadvantage those sectors which are currently investing heavily in the UK and would negatively impact upon the goals of the 2004–14 Science and Innovation Framework. The Research Councils' and RCUK's policies need to be aligned with the 2004–14 Science and Innovation Framework in such a manner to ensure that companies such as GSK continues to invest in the UK.

PROPOSALS FOR IMPROVING THE EFFECTIVENESS OF THE RESEARCH COUNCILS KNOWLEDGE TRANSFER ACTIVITIES

19. *Influencing the European agenda*

As we move towards the establishment of the Seventh EU R&D Framework programme, the establishment of the European Research Council and moves to establish a number of Joint European Technology Initiatives (JETIs, arising from the European Technology Platform programme) it is likely that the European Research Area (ERA) will have a greater impact upon the nature of the UK science base and knowledge transfer activity across Europe. Whilst the Research Councils clearly already do play a role in this field, we would suggest that they could (through RCUK) become more active in both influencing the environment and in helping academic groups to secure research training and mobility funding from the European Commission. The Research Councils do not appear, at present, to be particularly proactive in this area.

20. *The need for more international benchmarking*

The pharmaceutical industry operates in a global environment. We suggest that the UK Research Councils should seek to promote their knowledge transfer activities more in this global environment, and also to find ways of identifying (and introducing in the UK) those best practices of other research funding bodies working elsewhere in Europe and the USA.

21. *Relationships with the RDAs*

GSK feels that the current arrangements for the promotion of knowledge transfer by the Regional Development Agencies (RDAs) are not satisfactory, and we consider that there are real opportunities for the Research Councils to take a lead here. One can envisage a situation in which the RDAs and the Research Councils work more closely in identifying the needs of local companies and how these could be addressed through the stimulation of linkages with universities and research institutions elsewhere in the country.

February 2006

APPENDIX 10

Memorandum from the Association of the British Pharmaceutical Industry

KEY POINTS

The UK pharmaceutical has, historically been one of, if not the largest, sponsor and supporter of collaborative research in universities, in 2003 hosting 698 PhDs and over 400 additional separate collaborative research agreements—this amounted to in excess of £65 million, excluding costs of hosting students.

Good collaborative links between pharmaceutical companies and universities are a win-win: universities benefit from additional resource (in terms of high quality facilities, new technology and compounds); students benefit from industry experience with real scientific challenges at the cutting edge of research; and industry benefits from independent expertise with a wider research perspective.

The most effective form of knowledge transfer is “on the hoof”—in other words it occurs through the movement of people or placements or exchanges.

UK Pharmaceutical companies generally have good relationships with UK Research Councils, especially BBSRC and EPSRC who have been particularly responsive in supporting specific training initiatives and fundamental research areas of importance to biomedical science. MRC Technology has also improved the situation significantly in terms of relationships between MRC and companies.

While collaboration between Research Councils is generally good, further progress could be made through sharing best practice around innovative schemes and initiatives.

UK Research Councils could also look at the workings of other European Research Councils and consider different ways of working with industrial partners.

Current Government policy focuses too much on “technology” transfer and “exploitation” of intellectual property—this has led to unrealistic expectations of the value of IP and increasing difficulty in negotiating IP versus rewards, milestone payments and royalty streams.

While the UK had a unique capability in terms of access to the high-level skills and knowledge that underpins this industry—this is no longer the case.

The policy of charging “Full Economic Cost” has further increased the already high cost of collaborative research in the UK, while ignoring the value to academia of access to pharmaceutical R&D facilities and other ‘in kind’ contributions. Recent experiences indicate that post doctoral collaborations in the UK are becoming as expensive as those in US, and significantly more expensive than in several other European countries.

Due to escalating costs and increasing difficulty with IP discussions with universities, have led UK-based research facilities to increasingly place collaborative research proposals overseas, however the Lambert Model Agreements for collaborations are proving to be a very useful starting point when discussing the ownership of intellectual property with universities in the UK.

INTRODUCTION

The ABPI is the trade association for the pharmaceutical and biopharmaceutical industry in the UK. Members include large UK-based pharmaceutical companies, significant overseas investors in to the UK, emerging biopharmaceutical companies and contract research organisations.

The pharmaceutical and biopharmaceutical sectors are the leading private sector investors in R&D in the UK—in 2004, companies invested £3.244 billion in the UK. However recent trends indicate a stagnation of this investment³:

- There was a real terms decline of R&D investment from 2003 (£3.241 billion) to 2004 (£3.244 billion) of 2%—a small increase of 0.1% in cash terms.
- 2002 was the peak of UK R&D investment at £3.304 billion.

³ Figures from the Office of National Statistics.

-
- Pharmaceutical R&D capital expenditure has been in decline year-on-year from 2000 to 2004—there was a decline of 13.5% in cash terms in capital expenditure between 2003 and 2004.

The historical strength of the UK in attracting and growing R&D investment has been the supply of skills and access to fundamental knowledge in the research base. Access to skills and knowledge—especially in pre-clinical sciences, pharmacology, chemistry and early clinical development—was the UK's key competitive advantage.

However for a variety of reasons, many other countries have caught up with the UK in terms of provision of skills and are increasingly seeking ways to open up access to their research bases. Over the last five years, we have seen increasing investment in emerging countries, where these skills can now be accessed at much lower cost and with equal, and sometimes superior, quality.

There historical success of the UK is for multiple reasons. Without a doubt UK Government commitment to science and technology in recent years has built upon the strong research base that has been accessible to companies wishing to engage in collaborative research. In addition to the good supply of skills, it has created the environment to encourage the growth and success of pharmaceutical companies. A stable market brought about by the PPRS, has been essential in providing a stable market, recognising innovation while supporting fair returns for investment in R&D⁴.

Government policy has focused on a number of areas to sustain and grow the knowledge-driven economy, so that it is fit for the 21st century. In addition aggressive targets have been set for increasing R&D investment across the UK—the 10-year Science and Innovation Investment Framework published in July 2004 stated the Government wished to raise public and private sector R&D investment to 2.5% of GDP, from a baseline of 1.9%.

But the last fifteen years has seen a transformation on many fronts: mergers and acquisitions have created a truly global pharmaceutical industry; science and technology have moved forward significantly, especially around, genetics, molecular biology, informatics and high throughput assays; and developments in emerging countries mean that high technologies and skills are no longer the domain of the traditional “developed” world, eroding the UK's distinct competitive advantage. Competition for R&D investment has never been more intense.

Furthermore there have been significant pressures on the industry, from local issues such as animal rights extremists to a global move for “perfect” medicines with a zero-tolerance for risk and increasing hurdles to prove efficacy. The shift in benefit-risk balance has led to increasing regulatory requirements driving the cost of R&D, through the need for ever larger clinical studies and higher attrition of candidate medicines.

Companies can respond in a number of ways: for example, by utilising emerging science such as pharmacogenetics to target medicines against responders and reduce likelihood of adverse reactions; enhancing discovery and development, reducing attrition by the application of new technologies and knowledge; and also, by reducing the cost of R&D by moving it to low cost countries.

If the UK is to retain its current share of global R&D investment, it must ensure that it remains competitive in terms of its key competitive advantages of access to skills and knowledge. Recent Government initiatives to enhance “technology transfer”, while well intentioned have made it both more expensive and more difficult for companies to collaborate with universities.

KNOWLEDGE TRANSFER VERSUS TECHNOLOGY TRANSFER

The inquiry of the House of Commons Science & Technology Committee is focusing on “knowledge” transfer as opposed to “technology” transfer. While this may appear to be semantics the underlying outcome is quite different. Too often “technology” transfer is associated with “licensing” and retention of IP—filing of IP, in the early stages at least, can be a significant cost and with high attrition rates of candidate medicines in drug development, returns are by no means guaranteed.

It is essential that any patent is written in the most effective way, which requires knowledge of both the disease area and the global environment. Because of this high cost and high attrition, historically many companies entering in to collaborative research agreements with universities have sought to own the IP, while including reward and milestone payments and royalty streams should the IP reach the market. Coupled with clauses where the IP reverts to the academic partner should it not be taken forward, this provides a win-win: potential cash flow to the university/academic partner, while the industry bears the cost of the IP and the risk of exploitation. Currently the level of industrial income in UK Universities under the banner of collaborative research far outweighs the income from intellectual property.

⁴ It is worth noting however that the UK remains amongst the slowest in Europe in terms of uptake of new medicines and expends less than our key European competitors on the medicines budget.

Pharmaceutical industry collaboration with UK universities

The pharmaceutical industry has been one of the leading sectors in terms of collaborative research with universities—only aerospace collaborates on a similar scale and the approaches have been different. Aerospace companies such as Rolls Royce have tended to establish relationships with a number of leading departments, in this instance setting up “University Technology Centres”. Pharmaceutical companies have tended to look to establish links between company research scientists and research teams in universities where there is specific expertise in an area of relevance to the industry, these may not be departments which have an RAE rating of 5 or above for research. For example; several companies funded research teams within the Wolfson Centre at University of Greenwich, the 3a rated Biological Sciences Department at Oxford Brookes and the School of Pharmacy at the University of Bradford.

In 2003 the ABPI carried out a survey of its Academic Liaison Advisory Group regarding the number of studentships and grants that companies support in UK universities (Table 1) The table lists the collaboration agreements (which exclude contract and clinical research) of the companies represented on ABPI's Academic Liaison Advisory Group. The contribution from pharmaceutical companies totalled more than £70 million.

Table 1

**RESEARCH COLLABORATIONS AND PhD STUDENTSHIPS
WITH UK INSTITUTIONS 2003**

<i>Company</i>	<i>No of S/Ships</i>	<i>No of Grants</i>	<i>Total</i>
AstraZeneca	124	120	244
BTG	0	6	6
CAT	2	0	2
Chiron	7	5	12
Celltech	21	5	26
GlaxoSmithKline	357	218	575
Eli Lilly & Co	27	0	27
Merck Sharpe & Dohme	7	11	18
Novartis	14	0	14
Organon	16	0	16
Pfizer	108	58	166
Vernalis	7	0	7
Yamanouchi	2	0	2
Totals	685	418	1,115

Industry relationship with Research Councils

Overall members of the ABPI's Academic Liaison Advisory Group report that relationships with Research Councils have generally been very positive. However this does vary from Council to Council. Members report that Research Councils could work more effectively with companies if they were to share best practice, adopt more consistent approaches and improve the monitoring of projects to learn best practice and share success. In particular MRC, while currently improving links with pharmaceutical companies, could learn from successful BBSRC and EPSRC programmes.

Generally Research Councils take a pro-active role in seeking views of scientific experts in industry to inform their programmes. In particular, BBSRC and EPSRC have actively engaged and appointed pharmaceutical company experts to their relevant working groups: for example the “Technical Opportunity Panel” in EPSRC.

As illustrated in table 1, pharmaceutical companies have a long history of collaborating on research training. The CASE and Industrial Quota CASE Awards were very popular and are reflected in the high number of PhD studentships, with which companies were involved. Newer initiatives, such as Doctoral Training Accounts (where universities are encouraged to collaborate with industry) and Collaborative Training Accounts—both EPSRC—have also helped stimulate and encourage industry collaboration. Industrial Partnership Awards—which enhance priority of high quality research projects with substantial industry funding—have also been seen as a positive move by BBSRC, to boost knowledge transfer.

Specific examples of recent collaborations with Research Councils illustrate the range of innovative interactions which our member companies support.

- AstraZeneca are supporting a Doctoral Training Centre in the pharmaceutical sciences at the University of Nottingham School of Pharmacy in partnership with EPSRC. This is the first time a Doctoral Training Centre has been established with an industrial partner; training will be offered to 25 PhD students over five years, hence the training will benefit the pharmaceutical industry as a whole in years to come.

- Another EPSRC initiative, in partnership with GlaxoSmithKline, is the current call for proposals to support activity in the area of array chemistry. EPSRC are supporting this with up to £4 million and the appointees, up to four doctoral and 10 postdoctoral, will spend a considerable period of their appointment at GSK where they will have access to state of the art equipment. Successful projects are expected to form the basis for forging strong links between GSK and the research organisation.
- The BBSRC Modular Training for Industry programme is of particular value in fast moving areas of science as it enables industrial and academic scientists to work together to develop continuous professional development materials of value to industrial scientists. This is an example of the type of collaborative working which could be introduced by other Research Councils.
- BBSRC Industrial Partnership Scheme is another innovative way for industry to co-fund research with a Research Council; the 10% cash contribution industry makes to a grant makes it more likely that the grant will be approved at the peer review stage, hence encouraging academics to work with industry.
- The industry initiated “Integrated Pharmacology Fund” has been set up by major pharmaceutical companies to support *in vivo* pharmacology, physiology and toxicology research and training in the UK. Both BBSRC and MRC are providing substantial support for this initiative.

Relationships between Research Councils

At the ABPI Annual R&D Conference in November 2005, the ABPI brought together representatives of the most relevant UK Research Councils (BBSRC, EPSRC and MRC), representatives of the DTI Technology Group and Bioscience Unit and pharmaceutical companies to discuss ways of further enhancing interaction. The objective was to improve links on topics which cross the boundaries between individual councils, such as translational research. Continuing dialogue is taking place to develop these relationships and to work together to deliver the recommendations of the ABPI skills report, *Sustaining the skills pipeline in the pharmaceutical and biopharmaceutical industries*⁵.

Whilst increased interaction and sharing of best practice between UK Research Councils is welcome, we believe that there are also opportunities to learn from other European Research Councils. Member companies have highlighted two countries where collaboration has been particularly successful:

- Experiences with Dutch Research Councils indicate that they are more flexible in the types of activities they fund and in the demands they make of industrial partners.
- In Sweden interactions and sharing of knowledge is reported by some as being more “efficient”, although it was difficult to identify any particular specific activities.

CONCLUDING REMARKS

On balance the pharmaceutical industry has a positive relationship with UK Research Councils, with them being seen as an asset to the UK. BBSRC and EPSRC lead the way in their positive attitude to interaction, although MRC is closing the gap.

It is quite clear that the most effective means of “knowledge transfer” is through people—establishing effective collaborative partnerships very much depends upon personal interaction and often this is best achieved or facilitated by exchanges or placements or people.

Finally further progress could be made by sharing best practice, adopting more consistent approaches and learning by monitoring approaches to knowledge transfer.

March 2006

APPENDIX 11

Memorandum from the Campaign for Science & Engineering

VALUE FOR TAXPAYER’S MONEY INVESTED IN SCIENCE

Response to the House of Commons Science & Technology Committee’s Inquiry into knowledge transfer activities by the Research Councils.

⁵ “*Sustaining the Skills Pipeline in the pharmaceutical and biopharmaceutical industries*” ABPI November 2005.

1. The Campaign for Science & Engineering is pleased to submit this response to the Committee's inquiry into knowledge transfer activities. CaSE is a voluntary organisation campaigning for the health of science and technology throughout UK society, and is supported by over 1,500 individual members, and some 70 institutional members, including universities, learned societies, venture capitalists, financiers, industrial companies and publishers.

2. The science policy community has for years constantly reiterated the mantra that the UK is good at science but bad at turning it into wealth. This may have been true a decade ago, but it is only partially so now. We are certainly good at science, and although the UK may not be as good as the USA at knowledge transfer, it is at least as good as competitor countries, and better than most.

TERMINOLOGY

3. Neither the political community nor the science and engineering community can agree on a terminology for the various activities that form the focus of the Committee's inquiry. "Knowledge transfer", "technology transfer" and "translation" are all popular terms, while some people stress the two-way nature of the process by referring to "exchange". Different groups define different sets of activities using various expressions, and this can make it difficult to make useful comparisons.

4. In this response, CaSE takes the words "knowledge transfer" to be principally concerned with activities such as spinning out companies, collaborative research with industry, and the licensing of publicly-funded technology to the private sector. However, the most effective form of knowledge transfer is the movement of people between different public and private sector laboratories, who carry their accumulated knowledge with them.

5. The Research Councils form only one element of a much larger landscape of research and knowledge transfer activities, and so the Committee's inquiry has a very narrow focus. CaSE's response works from a slightly broader perspective. We believe the important question to be whether or not British taxpayers are getting economic value for money for their considerable investment in British science.

MONEY

6. The Research Councils invest about £70 million a year in knowledge transfer out of £100 million officially classed as "knowledge transfer". However, overall public support for the process of turning science into wealth is far greater. Bodies involved include the Higher Education Funding Councils, the Regional Development Agencies, the Department of Trade & Industry and HM Revenue & Customs.

7. For example, public funding for research and development carried out in industry comes from three main sources. The largest comes in the form of tax credits, costing between £700 million and £1 billion a year in lost revenue. The DTJ gives grants for research and development amounting to between £200 and £300 million a year, while the Research Councils award a very small proportion of their overall budgets to such research (about £10 million per year)².

8. This investment is not officially classed as "knowledge transfer" but is clearly part of the same overall picture of using British scientific and engineering expertise to generate new economic growth.

9. Even within the Research Councils, small pots of money appear as a bewildering array of fragmented initiatives. For example, on the website of the Biotechnology and Biological Sciences Research Council is a section on business and innovation, dedicated to "facilitating the application of knowledge . . . for the benefit of the UK economy". A series of links invite the reader to "Jump to a scheme". There are 14 different schemes, including Enterprise Fellowships, Faraday Partnerships, Intellectual Property Workshops, Knowledge Transfer Partnerships, and Modular Training for Industry³. If the £70 million spent by the Research Councils is distributed among 14 schemes in each of the six main Councils, each scheme within each Council distributes on average less than £1 million per year. (We stress that use the example of the BBSRC not because we believe it to be either typical or unusual, but because this information happens to be presented in an admirably clear way on its website).

10. Some of the schemes funded by the Research Councils are widely praised. Knowledge Transfer Partnerships in particular are highly thought of, and the new Integrated Knowledge Partnerships have been highlighted by CaSE's members as potentially very valuable. But this level of praise does not extend to all of the many individually named initiatives. It may be better in some cases to amalgamate the money into a single pot with a degree of flexibility over how the money might be best used.

11. However, we should stress that, in general, the Research Councils perform well against the other public funding bodies that support innovation. Some of the Regional Development Agencies, for example, have clearly not yet fully understood their role in supporting the process of generating wealth from research. They seem to have two very different areas of focus. First, they are agents for channelling public investment into local regeneration projects. Second, they have an agenda more concerned with the global exploitation of knowledge. Both may be valuable, but while the former can legitimately be organised at a regional level, the latter cannot. There is no reason why a particular challenge faced by an individual business should be best addressed through the knowledge and expertise in a local research institution.

12. Government policy had a renewed focus on knowledge transfer from the time of the 1998 Comprehensive Spending Review⁴. In some quarters, it has clearly been seen as a way of generating substantial extra funds for the universities. Since higher education institutes are always underfunded, and will continue to be so because other areas (such as secondary schools) have higher priority, new income streams are important. However, it is unrealistic to believe that knowledge transfer activities will solve the difficulties of financing science and engineering in universities. The best institutions in the world at generating income from their knowledge obtain less than 5% of their research income in this way. This income is welcome, not least because it is unencumbered by strings and caveats attached by Government, but it cannot replace universities' other main sources of income. Knowledge transfer is useful in stimulating extra economic activity in the economy as a whole, not as a way of hiding or resolving the inadequacies of existing funding mechanisms.

13. One particular problem with Research Council funding is concerned with collaborative work with industry. The introduction of 'full economic costs,' while admirable in principle, has only really been worked out in detail for Research Council grants. It has forced up the costs to industry of collaborating with British universities, and is likely to lead to a reduction in such collaborations. Although not necessarily officially classed as "knowledge transfer", collaborative projects between industry and academia are an extremely important element of the process by which research funded by the Research Councils is used for the benefit of the economy and society. The recent change has jeopardized the healthy future of such activities.

PULL AND PUSH

14. Most knowledge transfer policies in recent years have encouraged the "push" of knowledge out of the academic base into industry. There has been a culture change in the universities as a result, with key defining moments in 1993, with the publication of the White Paper *Realising our Potential* and at the time of the 1998 Comprehensive Spending Review⁶. That change has taken over a decade.

15. Policies to encourage "pull" from industry have been much less prevalent. While some sectors of the economy, such as the pharmaceutical and aerospace industries, engage with, and draw on the academic base in very effective ways, others do not. The fall in industrial research and development in the UK last year was particularly shocking when set against the rise in other mature economies such as that of the USA⁷.

16. Parts of the private sector have not matched the culture change of the universities. The reasons for this are not all entirely clear, but it is plain that policy drivers have not been strong enough. Money is typically channeled into public sector institutions, assuming that the knowledge they have already generated will be of use to a private sector partner if only that partner can be identified. It may well be more effective to channel resources through private sector players who have challenges that need solving, so that they can identify those people within the research community who may be able to help them. Industrialists are not going to collaborate with universities for the sake of it, unless they can see some actual or potential benefit.

17. Rather than seeing academics as a single element of wider innovation landscape, recent policies have tended to assume that they can work across the whole spectrum of activities from world-class blue-skies research to running successful companies. The skill sets needed at each stage of the process are very different, and there is no reason to assume that any individual will necessarily be good at more than one stage, however brilliant they are at a single element.

OVERALL CO-ORDINATION

18. Overall, while Government policies on knowledge transfer in recent years have advanced considerably, they remain as a somewhat fragmented collection of relatively small initiatives distributed across various bodies, agencies and Departments, with relatively little coordination. CaSE certainly does not advocate a rigid, monolithic structure, but there is clearly room for much greater harmonization.

19. We would urge caution, however, in focusing too strongly on the Research Councils as the central engines of that coordination. Their primary role is to find and fund the best science and engineering research. Without a strong fundamental research base, there will be no knowledge worth transferring. The mantra that the UK is good at science but less good at turning its research into wealth has been repeated so often that the nation is in danger of forgetting that the first half of this statement is not carved in stone. If we want to continue to be good at science in a competitive world, the Research Councils cannot lose their focus on funding world-class research. Without very substantial new money and a clear protection of their role in funding fundamental research, we should not even consider them as candidates for the role of coordinating knowledge transfer activities.

NOTES AND REFERENCES

1. *Hansard* [House of Commons] 26 January 2004 Col 96W.
2. *ForwardLook 2003*, DTI; *Hansard* [House of Commons] 2 March 2004 Col 8 16W.
3. www.bbsrc.ac.uk/business!Welcome.html accessed on 20 January 2006.
4. *Modern Public Services for Britain: Investing in Reform*, HM Treasury, 1998 [Cm 4011].
5. *Realising our Potential: A Strategy for Science Engineering & Technology*, Cabinet Office, 1993 [Cm 2250].
6. *Modern Public Services for Britain: Investing in Reform*, HM Treasury, 1998 [Cm 4011].
7. The 2005 R&D Scoreboard, DTI, 2005.

APPENDIX 12

Memorandum from Momenta (a division of AEA Technology plc)

INTRODUCTION

1. Momenta is pleased to respond to the call for evidence by the House of Commons Science and Technology Select Committee on the subject of Research Council support for knowledge transfer.

2. Momenta has over 30 years experience in working at the interface between the knowledge base, business and the public sector and, during that time, has established a sound understanding of the broad-ranging stakeholder needs and drivers. Momenta provides strategic advice, programme and project management helping to put government policy into practice. Examples of knowledge transfer programmes undertaken by Momenta on behalf of UK government are the management and delivery of the Knowledge Transfer Partnerships (KTP), the BIO-WISE and the Envirowise programmes.

3. We have developed extensive first-hand experience of knowledge transfer through our involvement with these and other major government programmes, as well as in work for government undertaken elsewhere within AEA Technology plc (eg on national and international atmospheric emissions inventories, air quality modelling, monitoring and forecasting). As a private sector organisation we are able to recognise the industry perspective and comment from our own experience on the particular needs of UK business.

PROMOTION OF COLLABORATIVE WORKING BETWEEN RESEARCHERS AND PARTNERS IN INDUSTRY, INCLUDING IN THE CREATIVE INDUSTRIES AND IN SMEs

4. We acknowledge the efforts being made by the Research Councils to encourage collaborative working between researchers and industry. For example, EPSRC has set specific targets for increasing expenditure on collaborative projects and the number of doctoral students involved in collaboration. However, we see little indication that the choice of collaborative partner is being guided by national need or indeed any clear strategy, other than one of partnering with selected R&D-intensive companies.

5. Studies show that even innovative companies in the UK make relatively little use of the research base as a source of innovation,¹³ and we believe that it is in this context that “promotion of collaborative working” should be addressed. Achieving clear objectives, such as the broadening of collaboration to support strategic national interests and policy, is partly a marketing challenge and partly a challenge in changing behaviour. In Momenta’s view, meeting such challenges lies outside the current experience of the Research Councils and needs to be “bought in” from specialist organisations.

STAKEHOLDER ENGAGEMENT AND COMMUNICATION

6. Successful knowledge transfer should be, above all, a two-way process between the research base and industry. Yet it is largely effected at present through technology “push” from academia (driven partly by pressure to exploit intellectual property), rather than by any “pull” from industry. One reason for this is the very low awareness in industry, and particularly amongst SMEs, of what knowledge is being generated by the research base and how it might be exploited to competitive advantage of companies. The move by some Research Councils to establish knowledge brokerage, or equivalent, units is a step in the right direction, but it falls short of the need for professional, sustained and targeted marketing and engagement with the business community.

¹³ The recent CIS3 survey reports that of the 44% of enterprises with innovation activity during the period 1998 to 2000, only 5% identified Higher Education Institutions as sources of knowledge or information important for innovation. Of the enterprises reporting some form of innovation co-operation during that period, only 9% were partnered with Higher Education Institutions.

7. Drawing on Momena's experience with government, businesses and the public, we are aware that marketing to disparate groups (and especially SMEs) requires communications strategies, stakeholder engagement at appropriate levels, communications plans and effective implementation. Stakeholder engagement and communication is a two-way process and, to work properly, requires sustained connectivity and not simply "networking" through a largely one-way flow of information. This is another area of expertise that in our view needs to be "bought in" by the Research Councils through the services of a specialist organisation.

RESULTS AND PERFORMANCE MANAGEMENT

8. Collaboration and knowledge transfer between researchers and industry can, and does, take many different forms, including managed initiatives such as Faraday Partnerships as well as partnerships forged directly between the parties. The Research Councils continue to introduce new initiatives that add to the wide range of mechanisms already available. We believe that there is an urgent need to take stock of which collaborative mechanisms work, and which don't, through an evidence-based study of the knowledge transfer process, and that this study should guide all future knowledge transfer initiatives, as well as the consolidation of existing ones into a simpler, proven scheme.

9. We recognise the progress made by the Research Councils in introducing knowledge transfer metrics into their Delivery Plans. However, we are concerned that what is being measured is largely activity rather than outcomes, and that the metrics are inappropriate for assessing the benefits to the UK taxpayer accruing from the considerable investment in both research and knowledge transfer. The Knowledge Transfer Partnerships programme has 30 years of experience in delivering effective knowledge transfer, using well-established metrics relating to outputs, and in recent work developing metrics for longer-term outcomes. Momena recommends that the Research Councils should seek to learn from this experience in developing more relevant outcome-related metrics for the research that they fund.

CO-ORDINATION BETWEEN THE COUNCILS AND THE ROLE OF RCUK

10. We note RCUK's remit to "coordinate and harmonise increased engagement in innovation and knowledge transfer by the Research Councils". RCUK has a clear role, therefore, in coordinating the promotion of collaboration, stakeholder engagement and the development of outcome-related metrics through the "bought-in" services recommended above. We believe that there would be advantages in providing such services at RCUK level, acting for all the Research Councils, in order to deliver improved knowledge transfer through a single access point for industry, while achieving economies of scale by avoiding multiplication of effort.

11. Finally, we believe that knowledge transfer needs to be made an integral part of the grant approval, monitoring and review process, with the aim of achieving an equivalent level of quality in knowledge transfer as in research. Momena believes that this will require the introduction of a formal peer review process for knowledge transfer proposals, equivalent to that already in place for the research component. In other words, the knowledge transfer component of research proposals should be reviewed by knowledge transfer professionals, in the same way that the research component is reviewed by an academic of sufficient standing and experience. It would be RCUK's role to coordinate such a change.

15 February 2006

APPENDIX 13

Memorandum from the Institute of Physics

RESEARCH COUNCIL SUPPORT FOR KNOWLEDGE TRANSFER

The Institute of Physics is a scientific membership organisation devoted to increasing the understanding and application of physics. It has an extensive worldwide membership (currently over 35,000) and is a leading communicator of physics with all audiences from specialists through government to the general public.

The Institute welcomes the opportunity to respond to the House of Commons Science and Technology Committee's Inquiry into Research Council Support for Knowledge Transfer.

GENERAL PRINCIPLES OF KNOWLEDGE TRANSFER PROCESSES

The Institute aims to strengthen and support the health of physics based enterprises, in particular by promoting and facilitating innovation. The Institute operates its own knowledge transfer networks (the emerging technology programmes in nanotechnology, biotechnology and optics) with meetings often run in collaboration with Research Councils.

The Institute believes that knowledge transfer processes should follow a number of general principles. They should:

- Focus on stimulating and supporting demand pull rather than technology push. Demand-pull is crucial for effective knowledge transfer and should permeate all components of the knowledge transfer process.
- Focus on impact rather than activity per se. It is vital to build up a strong evidence base of what mechanisms have the most impact and in what circumstances.
- Be systemised and embedded in the culture of research departments and business R&D by linking directly to knowledge transfer metrics influencing assessment criteria.

In addition, the Institute is of the view that:

- Mechanisms for collaboration must recognise the significantly different timescales to which industry and academia usually work.
- Intermediary bodies (eg Research & Technology Organisations, professional Institutes and knowledge transfer agencies) can play an important role in helping to reconcile the fundamentally different goals and objectives of academia and industry (eg the quest for knowledge vs. economic growth), by bringing the relevant people together. However, they must not be seen as a replacement for direct interaction.
- Intellectual Property needs to be managed sensibly by recognising that it is best owned and managed by the exploiting party, while ensuring that collaborating parties receive appropriate rights and returns that reflect their contributions.
- People-based schemes such as placements and secondments are an effective mechanism for knowledge transfer that could be more widely supported.
- Co-ordination across Research Councils is important and should extend to working with government departments so that all publicly-funded research reflects a coherent national strategy, rather than the fragmented set of strategies that we have at present.
- Care must be taken to ensure that any potential strategy is not directive, stifling innovation in research at birth.
- Within a competitive and global market for research, industry will place contracts according to where it can get the greatest value for money. The move to full economic costing in the science base may not be helpful to the UK if it used rigidly to set the price for work by academia for industry.

RESEARCH COUNCIL SUPPORT FOR KNOWLEDGE TRANSFER

The basic principle of funding universities to support knowledge transfer is excellent. An international panel of scientists, who recently undertook a review of the quality of UK physics and astronomy research, noted that the Research Councils have been promoting knowledge and technology transfer through their knowledge transfer schemes, and have many success stories such as the “Cambridge” phenomena (eg Cambridge Display Technology) and within the SUPA collaboration. The international panel suggested that “UK plc” would greatly benefit by having similar schemes throughout the country.

The recent statement made by the chief executive of PPARC to the Committee about PPARC requiring most grant applicants to provide plans for knowledge transfer activities, is a welcome development, and it is hoped that the other Research Councils will follow suit.

SPECIFIC AREAS OF CONCERN

There are a number of concerns that need to be addressed:

- Stimulating Market Pull. Knowledge transfer involves two bodies: the initiator and the receiver of that knowledge (as a simplification as the relationship is often more complex in practise). The Research Councils have struggled to get the initiators to make serious efforts at such transfer, and have no control over the intended recipients (usually industry). It is becoming increasingly rare for industry (except some of the very large multinationals) to have scientific staff with the experience and judgement to act as recipients, or even to decide what their needs are. The very poor record of research funding in UK industry is an illustration of this trend. The collapse of the large laboratories (whether government or industry) has made things worse.

There is too much encouragement of technology push and not enough user pull at the start of research. This leads to scattered and fragmented activity without significant and complete outcomes. Users have their own priorities and will only respond to academic demands when there is mutual benefit and recognition. At present, collaboration happens more by chance than any strategic plan.

-
- Distinguishing between applied and blue sky research. It is important to recognise and support distinct funding streams for application of research and really innovative research where there is no application envisaged. At present there are attempts to show industry relevance for almost everything which can lead to weak and ineffective links across the board. Strong coupling where there is true benefit likely and no attempt to couple really original investigations would be more effective.
 - Acknowledging priorities. The use of the term ‘third stream’ funding for knowledge transfer activities unfortunately reflects the view held by many universities on the relative priority and value of knowledge transfer activities compared to research and teaching. If knowledge transfer is to happen as a priority then alternative terminology to describe the different funding streams may be helpful.
 - Nurturing Relationships. Improving management of expectations on both sides of the industry-academia interface are essential. Industry must be made aware that there are no researchers sitting around ready to do small, short term, projects. It is impossible to respond on the timescale expected in industry. Academics must realise that research in industry is more like development. The Research Councils could take a more systematically proactive role in supporting and nurturing these relationships.
 - Co-ordinated National Strategy. The Research Councils need to identify strategic national user needs (with other stakeholders), and focus funding to achieve significant nationally relevant outcomes. The Technology Strategy Board has made a good start in this direction in its first year, but there is much more that can be done.
 - Effective Dissemination. The Research Councils must add value by identifying and promoting integrated results of their investment. Research Council communication is limited at present—they need to evaluate, integrate and communicate the value of what they support through grants. Too much is left to the universities.
 - Centres of Expertise. The Research Councils need to concentrate on and grow a small number of very much larger “centres” of expertise—current fragmented funding of small projects leads to numerous sub-critical units that are not visible and competitive by international standards; the competition is global and not between UK universities.
 - Training. New approaches need to be developed and Research Council and university staff need training—one cannot expect efficient knowledge transfer to just “occur on demand” if individuals are doing it untutored by trial and error.
 - Transferring People. The transfer of people is the most effective mechanism for knowledge transfer. This should involve young students and recent graduates as well as operating between experienced Research Council staff, researchers and industrialists. Access to people-based schemes for companies of all sizes and sectors could be improved.
 - Remove cap on the Follow-on Fund. The Research Council Follow-on Fund has been very successful in attracting good proof-of-concept proposals for initial funding to take research outputs to commercial propositions. There should be up to two calls per year and the financial cap on total proposal value from any university should be removed (EPSRC are the only Research Council to have such a cap).
 - Extended CRD Programme. Collaborative Research & Development (CRD) projects are very valuable but restricted because of their focus on specific programme areas and their short term nature. There should be a general CRD programme capable of supporting collaborative research in any area over long time periods.
 - Knowledge Transfer Metrics. Increased use of knowledge transfer metrics when assessing funding proposals would be welcomed. This should be combined, where appropriate, with more emphasis on post project reviews of successful exploitation activities. Success criteria should focus on meeting “market need”. However, care must be taken not to take such an approach to extremes and restrict creative blue skies research that questions commonly held beliefs. Distinctions may need to be made between R&D themes during assessments.
 - Engaging SMEs. For small and medium sized companies it can be difficult to engage universities in collaborative high risk innovation projects. To this end there could be improved co-ordination of linked projects within the Research Councils together with better integration between the strategies of the Research Councils and government departments. More joint funding of long-term industry-led projects would be advantageous.

APPENDIX 14

Memorandum from the 1994 Group

RESEARCH COUNCIL SUPPORT FOR KNOWLEDGE TRANSFER

1. GENERAL POINTS

Knowledge transfer is an area of increasing interest and activity on the part of the Research Councils, but there is considerable variation between them in effort, approach and success. One reason for this is that there are numerous and potentially competing initiatives which must all work in harmony, for example, Research Councils, Regional Development Agencies, City Councils (ie Science City), HEFCE, DTI etc, not forgetting the Treasury encouraging knowledge transfer schemes on a more international basis (MIT/Cambridge). The Research Councils (and all the others) must take cognisance of these existing schemes and work within a coherent framework. Often, too much energy goes into understanding how all the layers may work together (or not) rather than in delivering clear outcomes that are well resourced. It is important not to create new layers just to demonstrate an initiative has been taken. Finally, it is essential that the Research Councils do not become too distracted from their primary mission to fund long-term research. It is important that scarce resources are not spread too thinly over too wide a remit of activity.

2. PROMOTION OF COLLABORATIVE WORKING BETWEEN RESEARCHERS AND PARTNERS IN INDUSTRY, INCLUDING IN THE CREATIVE INDUSTRIES AND IN SMEs

In the past, the focus has been on academia going out into industry, rather than encouraging industry into the academic community. Apart from studentships, most Research Councils do little actively to promote and reward collaborations between academic researchers and business. The new Arts and Humanities Research Council Knowledge Transfer Fellowship proposals, however, are an interesting new development in this area. There is clearly a role for Research Councils to encourage business to make use of university facilities, for example Research Council Fellowships and secondments for business to allow staff to work in Universities to undertake research projects.

In this context, it is important that the breadth of potential engagement is recognised. The establishment of the AHRC has provided the opportunity for a broadening of the understanding of knowledge transfer to include the impact of research on areas that include not only business but also museums and galleries, the heritage sector, the cultural sector, broadcasting and public policy, as well as a basis for attending specifically to the creative industries. This broad approach is welcomed, and it is important that it is maintained in the future. There are, however, challenges in relation to knowledge transfer in the creative industries because existing business models are of only limited help. It is very important that the DTI and OST continue to be open to the approaches being developed by the AHRC to address these challenges.

Despite this support, there remains an overriding concern that there will be no new money for knowledge transfer awarded to the Research Councils forcing them to divert sums away from basic research grants. Knowledge transfer cannot happen unless the basic research is being done in first place.

3. STAKEHOLDER ENGAGEMENT AND COMMUNICATION

Not surprisingly, the Councils appear to consult primarily with those on their Councils and Boards. We understand that they hold high-level discussions with the RDAs, but there does not seem to be much exchange at senior working level between those delivering RDA support and those managing Enterprise and Innovation offices in the universities. The result is that coordination between the various funding streams is poor, with the universities being expected to join up and make sense of sometimes disconnected policies. Multiple funders and stakeholders make management and accountability complex and in some cases unnecessarily burdensome.

The engagement of academic staff in knowledge transfer activities is one of the primary goals of university HEIF-funded staff. The Research Councils have a role in stimulating that engagement by emphasising the Knowledge Transfer element of their awards—requiring evidence of commercial or societal need, possible applications, and future benefits to society from research, if funded. We have observed that in the case of Research Councils (such as BBSRC) where questions are explicitly asked at the time of a grant application, we have had an opportunity to educate and engage with academic staff with respect to the Knowledge Transfer agenda. We would support Research Council policies that required the anticipated or hoped-for Knowledge Transfer routes to be explored and articulated as an essential part of the funding application process.

4. RESULTS AND PERFORMANCE MANAGEMENT

If knowledge transfer is to become genuinely a core business of UK universities alongside teaching and research then the RAE needs to clearly recognise and reward academic engagement with the enterprise and innovation agenda so that it is not seen as a distraction. Without this, it will be difficult for universities to change their internal reward and recognition systems so that knowledge transfer sits as an equal alongside teaching and research. Is it possible for the Research Councils to show leadership here?

On one detailed matter, Research Councils essentially place the onus on HEIs to commercialise or otherwise transfer new knowledge, and this is as it should be. It is especially helpful that Research Councils make no claim to ownership of resulting intellectual property, nor do they expect to share in any income that HEIs might enjoy from licensing or equity deals. However, we would welcome a clearer directive from the Research Councils regarding their expectation that the proceeds of commercial success should be shared with the HEI generating the new knowledge. This could help HEIs to better manage the expectations of commercial partners, would simplify and speed up commercial negotiations, and might allow more licence and option agreements to be concluded.

Finally, we would like to see all Research Councils adopt the same approach to Follow-on-Funds as that embraced by the BBSRC—ie a call open to all, to support development from any former research that was funded by that Research Council.

5. CO-ORDINATION BETWEEN THE COUNCILS AND THE ROLE OF RCUK

Co-ordination and, more importantly, joint working across the councils must be improved. Many opportunities to link the university research base with business lie across the responsibilities of the Councils. There are isolated examples of joint programmes but in general, their work in this area does not give enough attention to joint approaches. For example, the recent call by the EPSRC for Integrated Knowledge Centres is an interesting development but since it was issued by the EPSRC on its own and not in collaboration with other councils, it rules out some of the most innovative and exciting possibilities such as Biorefining.

February 2006

Annex A

THE 1994 GROUP

The 1994 Group of internationally renowned universities engaged in leading-edge research and high-quality teaching is committed to meeting the diverse needs of students, staff and policy makers. The 1994 Group provides a framework for collaboration between research-intensive universities in the UK. The aim of this collaboration is to enhance the ability of member universities to act collectively where appropriate whilst maintaining their individuality and thriving in the highly competitive higher education sector.

The Group's main aims are to:

- secure widespread recognition that enables it to influence decision and policy making groups;
- achieve awareness and profile that underpins the ambitions of member universities in global markets;
- promote the need for diverse and distributed centres for research and teaching excellence;
- share good practice that enhances the staff and student experience; and
- provide services that enable members to respond flexibly and rapidly to developing market conditions.

Group members are committed to shared values. These are that:

- institutional identities and tradition can be respected and aligned with innovative thinking;
- research intensive universities should play a full role at local, regional, national and international level;
- high quality research and teaching are mutually supportive and should reinforce each other; and
- students and staff from diverse backgrounds should be enabled to maximise their potential in a well-maintained environment that provides a stimulating choice of academic, cultural, and social opportunities.

The current members of the 1994 Group are:

University of Bath, Birkbeck College, University of Durham, University of East Anglia, University of Essex, University of Exeter, Goldsmiths College University of London, Royal Holloway University of London, Lancaster University, London School of Economics, University of Reading, University of St Andrews, University of Surrey, University of Sussex, University of Warwick, and University of York.

APPENDIX 15

Memorandum from the CMU Universities Group

RESEARCH COUNCIL SUPPORT FOR KNOWLEDGE TRANSFER

BACKGROUND

1. The CMU Universities group promotes policies on behalf of over 30 post-92 universities and welcomes the opportunity to give evidence in respect of the Committee's Enquiry into Research Council support for Knowledge Transfer. CMU institutions are sometimes referred to as modern universities although the origins of many derive from education provision which dates back to the 19th century. These universities have long track records in providing creative and lively learning environments for students, of being socially and culturally inclusive and of providing different access and progression routes to higher education and courses, including postgraduate courses, linked to continuous professional development. As a result, a much higher percentage of mature full-time undergraduate students study at our universities (where the average age of students is early to mid-twenties). Many of the 43% of undergraduates who now study part-time also study at CMU institutions.

KNOWLEDGE TRANSFER ACTIVITIES, MODERN UNIVERSITIES AND RESEARCH COUNCIL FUNDING

2. Post-92 universities are also known for relevant and applied research, in spite of the funding bias of the Research Assessment Exercises (RAE) and the increasing concentration of research funding on fewer and fewer institutions. In fact, through HEIF (Higher Education Innovation Fund) and by accessing other sources of funding (eg European Region funds) modern universities have been innovative and proactive in promoting knowledge transfer and university-business collaboration. They have developed considerable expertise in:

- facilitating and promoting knowledge transfer activities which are user-led and which add value;
- supporting SMEs as well as larger companies;
- working with the creative industries which are excluded from the RAE;
- evaluating results and performance; and
- identifying issues key to the success of knowledge transfer partnerships.

3. These key issues include the necessity of appropriate marketing, the need to avoid concentration on the graduate associate rather than on the needs of companies, the disadvantages of complicated and long-winded application processes, slow response times which may mean that a small company may have "changed direction", the disadvantages for some companies of knowledge transfer funding which requires, for example, a five year plan and the possibilities of, and issues arising from, knowledge transfer activities with companies that have between five and 30 employees.

4. Notwithstanding this expertise (in knowledge transfer activities), Research Council funding is dominated by peer group assessment and criteria for distribution which have continued to favour the research-intensive universities to the exclusion of post-92 universities. Research Council knowledge transfer can itself appear to be an extension of funding for research students. Furthermore, concentration by funders generally on high technology, biotechnology and bioscience start ups has also disadvantaged companies which do not fall into this category (and indeed regions where there are not a large number of companies of this type, at least at present).

SUMMARY

5. The CMU Universities group considers that the Enquiry into Research Council funding and knowledge transfer activities should consider the extent to which Research Council funding has actually been informed by or promoted the knowledge transfer activities and expertise of post-92 universities. Accordingly, we would be pleased to expand on this evidence in an oral evidence session before the Committee.

APPENDIX 16

Memorandum from CBI (Confederation of British Industry)

RESEARCH COUNCILS AND KNOWLEDGE TRANSFER

INTRODUCTION

1. There is an economic imperative for productive engagement between businesses and universities. The creation, transfer and exploitation of knowledge is recognised by government, the higher education (HE) sector and industry alike as one of the keys to successful innovation in a modern economy. We welcome the attention that Government is paying to promoting collaboration and knowledge transfer, not least through the innovation activities of the RDAs, the development of HEIF and the activities of the Research Councils.

2. A key challenge for the Research Councils is to deliver value from public and private investments in the science base by strategically matching their support for research to the priority needs of users. In this regard we acknowledge and welcome the Research Councils' support for the knowledge transfer process.

3. However, there is work to be done to maximise the potential and effectiveness of engagement. The CBI/ QinetiQ Innovation Survey 2005 identified that, on balance, businesses rate the effectiveness of their collaborations with universities as poor.

4. Global competition in Higher Education is intensifying. A recent report from the Council for Industry and Higher Education¹⁴ observes that UK HEIs are increasingly vulnerable to the relocation of near market and clinical R&D to major international markets (principally China and India).

5. The comparative competitiveness of the UK science base as a partner for innovation activity, is further highlighted by the introduction of Full Economic Costing, the short-term impact of which is likely to be a reduction in the volume of R&D conducted in the UK.

6. Greater responsiveness, more effective knowledge transfer, international benchmarking and structured performance improvement could all help reverse the perception of a UK science base whose competitiveness is depreciating.

7. In addition, knowledge transfer must lose its "third stream" tag. As long as it is referred to as such it will be considered a peripheral activity. If we truly believe that greater and more effective knowledge transfer is important to the UK's future competitiveness, then it must become a core activity alongside teaching and research.

SUMMARY

8. Successful knowledge transfer activities are those that are rooted in, and reflect, user needs. This is not solely about technology push. It also requires customer pull—the market influencing the science base. The development and maintenance of high quality stakeholder relationships are therefore essential to success.

9. The movement of people is widely acknowledged to be one of the most effective agents of knowledge transfer. The Research Councils must ensure the provision of effective programmes for exchange between the academic and business sectors and indeed *vice versa*.

10. While there are many academics who welcome opportunities to work on commercially orientated problems, there remain many that do not. The Research Councils have a vital role to play not only in identifying and encouraging those individuals and teams who have the skills and desire to work with business, but also in demonstrating to the wider community the value that business-university collaboration can deliver.

11. The Research Councils have a responsibility to demonstrate that they are both receptive and responsive to the views and needs of as wide a range of stakeholders as possible. We therefore encourage the Research Councils and RCUK to continue efforts to foster deeper and more widespread engagement with individual users and their representative organisations.

12. Currently engagement and communication with business users would appear to be patchy, with some Research Councils seemingly more focused and successful in their efforts to engage stakeholders. Each Research Council should have the opportunity to learn the best practices of their colleagues. The identification and sharing of good practice is a role that RCUK could usefully undertake.

13. Commercial innovation is often driven by the synthesis of knowledge from disparate disciplines and sources. Cross-council and interdisciplinary collaboration must therefore be placed high on the list of priorities for the Research Councils, collectively and individually.

14. The Research Councils must maximise the value of past and current activity that they have supported. Key to this is effective dissemination, which might include both an accessible back-catalogue and brokering activity.

¹⁴ "Higher Education, Meeting International Business Demand" CIHE (December, 2005) <http://www.cihe-uk.com/docs/PUBS/0512HEMIBD.pdf>

15. The focus for knowledge transfer activities has been on the physical and life sciences. The social sciences, the arts and humanities are now recognised also as having potential value for innovation. The Research Councils have a part to play in releasing that potential.

16. There is a clear demand for project planning and post-project review on the part of the Research Councils as a foundation for a results-oriented culture. Such improvements are necessary to ensure the effective use of funding while at the same time ensuring that exploitable knowledge does not remain undeveloped.

17. The Research Councils should investigate the merits of employing specialists with detailed knowledge of research content and proven project management experience to oversee projects. Lessons could be learned from the US, where project management skills are perceived to be better and a higher value placed on close management and successful delivery.

18. RCUK should work internationally to benchmark performance against research funding bodies in other countries and to identify and propagate international best practices across the UK research base.

19. Finally, it is critical that performance metrics not only include evaluation of impact on stakeholders, but also that the information is used to drive future strategy and continuous improvement.

PROMOTION OF COLLABORATIVE WORKING BETWEEN RESEARCHERS AND PARTNERS IN INDUSTRY, INCLUDING IN THE CREATIVE INDUSTRIES AND IN SMEs

20. Commercial innovation is often driven by the synthesis of knowledge from disparate disciplines and sources. Cross-council and interdisciplinary collaboration must therefore be placed high on the list of priorities for the Research Councils, both collectively and individually.

21. Successful programmes require both science base push and customer pull. High quality stakeholder relationships are therefore essential.

22. The movement of people is widely acknowledged to be one of the most effective agents of knowledge transfer and the Research Councils must ensure the provision of effective programmes for exchange between the academic and business sectors and vice versa.

23. Many (but not all) academics relish the opportunity of tackling commercially orientated problems. The Research Councils have a vital role to play in identifying and bringing to the fore those individuals or teams who have the skills and the desire to work with business on the challenges they face.

24. In our view, the effective interchange of people and the exchange of knowledge between academia and industry would profit from enhanced relationships between the Research Councils and the Regional Development Agencies (RDAs). The Research Councils, as custodians of the research base, know where the talent and knowledge is to be found in the UK. The RDAs ought to have an insight into the specific needs of the companies in their regions. Together, they have the potential to catalyse the transfer and exploitation of knowledge by brokering exchanges and collaborative working which directly responds to the needs of the whole business community, including SMEs. It is important that the focus of such activity includes the social sciences, the arts and humanities, as well as the physical and life sciences.

25. We would encourage the RDAs and Research Councils to work together to improve their own collaboration in order that this type of support can be successfully delivered.

26. The Research Councils must ensure that support for collaboration does not overlook experienced staff and researchers and focus only on younger students and recent graduates. Furthermore, such schemes must recognise that the flow does not occur in one direction only—the movement of people and the flow of knowledge from industry to academia are highly important too.

27. Having acknowledged the important role played by the Research Councils in fostering and facilitating collaboration, it is essential that the Research Councils are sufficiently resourced to perform this function adequately.

There are a numerous good examples of Research Council support for collaborative working:

28. The Link franchises¹⁵ operated by the Engineering and Physical Sciences Research Council (EPSRC), Biology and Biological Sciences Research Council (BBSRC) and Medical Research Council (MRC) to support collaborative R&D provide a good framework for effective interchange between industry and HEIs.

29. There are some good examples of bilateral initiatives which have been instituted to develop emerging technology areas. For example, GlaxoSmithKline is working with EPSRC on reactions, design and interpretation in the field of array chemistry.¹⁶ A novel feature of this call is that all applications must be discussed with and approved by an identified GSK contact before being submitted to EPSRC, thus ensuring they are industrially relevant.

¹⁵ <http://www.ost.gov.uk/link/program.html>

¹⁶ <http://www.epsrc.ac.uk/CMSWeb/Downloads/Calls/ArrayChemistry2006Call.doc>

30. A well-respected form of collaborative working, which is not focused on research, is the Modular Training for Industry programme run by BBSRC.¹⁷ The programme provides current, industrially relevant, technical training for graduates who work in industry. A pre-requisite of funding is that courses must demonstrably respond to an identified industry need. The training itself is developed in close collaboration with industry.

31. One good example of “sector-wide” initiatives with Research Councils is a partnership between the BBSRC, MRC, HE Funding Councils, the British Pharmacological Society and a number of pharmaceutical companies, which has seen the establishment of an £11 million fund to increase capacity building in integrative mammalian biology. The fund was developed in response to a number of specific needs identified by the pharmaceutical sector and its inception highlights the importance of high quality stakeholder engagement.

STAKEHOLDER ENGAGEMENT AND COMMUNICATION

32. Collectively and individually the Research Councils have many stakeholders, whose needs and expectations are varied and changeable. Accepting that effective communication with a large and diverse community is no easy undertaking, the Research Councils nevertheless have a responsibility to demonstrate that they are receptive to the views, and responsive to the needs, of as wide a range of stakeholders as possible.

33. We therefore encourage the Research Councils and RCUK to continue efforts to foster deeper and more widespread engagement with user organisations.

34. Improved levels of engagement will do much to ensure that the Research Councils are seen to sponsor research which is relevant to UK industry, which in turn should have a positive effect on the level and quality of collaboration between researchers and business. For example, the EPSRC practice of placing an Associate Programme Manager on a short secondment to industry improves industry’s perception of the Council and stimulates more results-oriented research.

35. At present, however, engagement and communication with business users would appear to be patchy, with some Councils seemingly more focused and successful in their efforts to engage stakeholders. Each Council should have the opportunity to learn the best practices of their colleagues. The identification and sharing of good practice is a role that RCUK could usefully undertake.

36. From outside, the Research Councils appear to exhibit (or be driven by) different “cultural characteristics”. EPSRC, for example, is considered by some to be more open, flexible and innovative in comparison to other Research Councils. This is reflected at an operational level. For example the EPSRC model, which emphasises the need for programme managers to engage closely with the user community, is considered by some to be exemplary. The approach to programme management also reflects a culture of flexibility and responsiveness to user needs as demonstrated by the approach taken to the Chemical Array call with GSK (paragraph 29).

37. Whether such openness or flexibility is a product of higher levels of engagement with the user community or the other way around, it is not possible to say. In any case, the two are complementary and should be encouraged across the Research Councils.

38. To a certain extent the level and quality of engagement may well depend on how dispersed or organised an industry sector is. Some sectors, and indeed companies, have identifiable, well informed spokespeople who are responsible for communicating needs, views and priorities to the Research Councils and other parts of the research base. The same is not (and cannot be) true for all businesses or other research users. Where there are identifiable gaps in effective engagement the Research Councils must develop plans and make extensive efforts to improve contact with “hard to reach” areas of the user community.

RESULTS AND PERFORMANCE MANAGEMENT

39. The primary challenge facing the Research Councils is to realise the greatest possible value (social and economic) from public and private investments in the research base. In this regard, a focus on results and performance management should be a very high priority for the Research Councils.

40. The Research Councils must continue to fund basic and blue-sky research. However, this should not comprise the sole focus of activity. Research Council-funded activity should also address identified user needs and potential applications. Presently, there is insufficient focus on meeting user needs at the outset of research projects. In many cases this leads to scattered and fragmented activity without significant and complete outcomes.

¹⁷ <http://www.bbsrc.ac.uk/business/cpd/modular.html>£1

41. There is a clear demand for project planning and post-project review on the part of the Research Councils as a foundation for a results-oriented culture. Such improvements are necessary to ensure the effective use of funding while at the same time ensuring that exploitable knowledge does not remain undeveloped.

42. At an operational level, programme management could be enhanced in a number of key areas:

- Definitive success criteria should be established, to enable a clear understanding of the outcomes which are sought.
- Clear delivery time-scales and project milestones should be developed and monitored, to ensure continuing relevance of the research project.
- Performance metrics which emphasise the primacy of research quality in terms of relevance, potential for exploitation and knowledge transfer should be utilised more widely. While research must not become a “metrics-driven”, they remain a useful aid to ensure that the emphasis is squarely on relevance and delivery.
- Post-project review procedures need to be developed and consolidated to enable the cross-correlation of projected outcomes with actual outcomes and their application/commercial impact. This would permit the Research Councils to evaluate and communicate the value of the work they support more readily.

43. Wider adoption of a number of the good practices outlined above (paragraphs 28–31 & 34) may contribute to increased performance levels across the Research Councils.

44. It is essential that Research Council staff understand both academic and industrial needs. Currently, the perception from industry is that the balance of experience within the Councils tends to the academic sector. The Research Councils should review the experience and makeup of their staff and where necessary take steps to address any imbalance by recruiting more staff with business experience.

45. In particular, the Research Councils should investigate the merits of employing specialists with detailed knowledge of research content and proven project management experience to oversee projects. Lessons could be learned from the US, where project management skills are perceived to be better and a higher value placed on close management and successful delivery.

46. In addition, there is further need to engender cultural change within the academic community itself. Some of the best results are gained from engaging academics who are eager to commit to and engage in the investigation of commercial problems. This requires a certain mindset and a willingness to operate outside of traditional academic models or cultures. The Research Councils have a role to play both in identifying and supporting these types of individuals, and creating a culture in which the profile and value of commercially focused research is raised.

47. The Research Councils must ensure that they maximise the potential value of current and historic research. We encourage them to explore the viability and likely impact of two vehicles for disseminating the results of the research they fund:

- A useable archive of knowledge generated by historic projects.
- A brokering system for disseminating knowledge to businesses (in conjunction with the RDAs—paragraph 24).

Both of these vehicles should support the dissemination of knowledge across disciplinary boundaries, and draw together the often fragmented results and activities which in combination may have an impact on a commercial problem.

48. A results-orientated culture built on improved project management may enhance the Research Councils’ ability to focus on and support strategic priorities. Close monitoring may help the Councils to identify those key areas which require long-term, structured support while at the same time enabling them to identify areas from which support should be scaled down or withdrawn altogether. Research Councils must use performance metrics—in relation to their own operations and the conduct of activities that they fund—in order to inform future strategy, change and continuous improvement.

CO-ORDINATION BETWEEN THE COUNCILS AND THE ROLE OF RCUK

49. RCUK is intended to serve a highly important purpose, and the need for such a body is widely accepted. However, RCUK’s mission,¹⁸ while laudable, is not yet being realised.

50. We accept that RCUK faced a number of difficulties in its early days—a lack of clear role and objectives, unclear relationships with OST, DGRC and individual Research Councils—as discussed in the 2004 OST Review.¹⁹ However, RCUK must endeavour to work across the Research Councils and with the various user communities, to identify and support strategic research priorities for the UK.

¹⁸ “RCUK’s mission is to optimise the ways that Research Councils work together to deliver their goals, to enhance the overall performance and impact of UK research, training and knowledge transfer and to be recognised by academia, business and government for excellence in research sponsorship.” (<http://www.rcuk.ac.uk/documents/mission.pdf>)

¹⁹ http://www.ost.gov.uk/research/final_report.pdf

51. RCUK's focus on Research Council co-operation to improve collective performance and impact is appropriate but further, more extensive efforts towards harmonisation and rationalisation across the research base are required. The government should investigate opportunities for merging funding schemes operated by the major funders of the research base (including the Research Councils) around agreed national priorities (with specific reference to the Technology Strategy).

52. The ability of the Research Councils to combine effectively is impeded by a number of factors—disparate cultures, different practices and operating models, varying levels of user engagement and responsiveness. As a consequence, they are effectively operating below their collective capacity. There is a very strong need for RCUK to identify and disseminate best practice across the Research Councils to ensure that they are operating with optimum efficiency and having the greatest possible impact, collectively and individually.

53. In addition, RCUK should work internationally (over and above the international engagements of the individual Research Councils and their heads), to benchmark performance against research funding bodies in other countries and to identify and propagate international best practices across the UK research base.

February 2006

APPENDIX 17

Memorandum from QinetiQ

RESEARCH COUNCIL SUPPORT FOR KNOWLEDGE TRANSFER

INTRODUCTION

QinetiQ is Europe's largest commercial provider of research and technology professional services, with 11,500 employees world wide and 9,000 in the UK. Having evolved from the research laboratories of the Ministry of Defence into the private sector, knowledge transfer lies at the core of QinetiQ's activities as it increasingly converts its world leading military technologies into commercial applications in security, health care, transport, environmental protection and other fields.

QinetiQ's evidence is drawn from more than 15 years experience of the journey from being government laboratories detached from the industrial main stream to becoming a successful, growing and international company listed on the London Stock Exchange.

QinetiQ positions itself in the supply chain between the blue sky researchers in universities and the product manufacturers in industry. We have deep engagement with the UK university sector which has recently been taken forward through a series of formal partnerships. At the same time we earn substantial and growing revenues from business relationships with more than 1,000 commercial customers. We have learned that technology exploitation cannot be achieved by either market knowledge or technology invention alone. It is the ability to span the great divide between the two that unlocks the hidden potential.

QinetiQ has direct links with the Research Councils, particularly the EPSRC and PPARC. Dr Alison Hodge, QinetiQ's University Partnerships Director who compiled this evidence, is a member of EPSRC's User Panel; about 30 QinetiQ staff are members of its Peer Review College. QinetiQ also supports PPARC's Industrial Programme Support Scheme, by providing its Chairman and supporting the knowledge transfer process. The company is engaged with a number of Research Council-led initiatives to link business with academia. QinetiQ has also recently established, with the EPSRC, a Chair at Imperial College to study and take forward the process of Technology Transfer in the physical sciences.

QinetiQ welcomes the Research Councils' increased emphasis on support for Knowledge Transfer. We recognise the challenges of achieving this objective alongside the very different goals in teaching and basic research. Our evidence identifies where focus could be provided by the RCs to heighten the impact of their actions.

We welcome the Committee's decision to look into this subject, and have grouped our detailed comments under the four headings identified in the call for evidence.

EXECUTIVE SUMMARY

- (i) The Research Councils' (RCs) support for knowledge transfer is relatively new, and increasing. QinetiQ is supporting these initiatives and welcomes them.
- (ii) The RCs should be made fully accountable for generating and adding value to integrated portfolios of research that either advance the frontiers of purer science and knowledge or enhance national competitiveness through business.

- (iii) The RCs need to understand the cost and complexity of issues of knowledge transfer. They should bring in experienced practitioners from outside and train their staff and university researchers to embrace new knowledge transfer activities.
- (iv) Businesses can be engaged earlier in the process as active participants. Large companies and those involved themselves in research are well equipped to participate but SMEs will need targeted engagement to draw in.
- (v) The role of bodies other than the Universities (such as industry, venture capitalists, trade bodies) in knowledge transfer is being acknowledged. RC funds should therefore be open to these other bodies supporting technology transfer. Competitive awards would be assessed both for research quality and potential economic benefit.
- (vi) RCs, particularly in the physical sciences, should be prepared to devote a larger percentage of their funds to the innovation phase. Funding criteria need to be adjusted to incentivise applied science.
- (vii) RCs have an important role to play in supporting the Government's efforts to turn its procurement budget into an engine for innovation.
- (viii) Full involvement of key people is essential for knowledge transfer. RCs must facilitate more movement of not only younger students and recent graduates, but also experienced Council staff, researchers and industrialists.
- (ix) RCs must enable all stakeholders easier access to their organisation, including those less familiar with their research programmes. Their structures and processes are hard to understand, and their communications are predominantly to inform rather than to listen or gather information.
- (x) QinetiQ advocates more robust financial measures including the introduction of Full Economic Costs. With more experience, this will enable the RCs to value and consider the implications of their decisions, enabling better focus of national resources and hence better value for money in the longer term.

QinetiQ's evidence

Promotion of collaborative working between researchers and partners in industry, including in the creative industries and in SMEs.

1. The RCs are doing much more than previously to promote knowledge transfer between university researchers and industry. QinetiQ endorses this policy, seeing collaboration as a key enabler for more researchers to use their projects to support the national economy.

2. Given the costs and risks of technology exploitation there are relatively few companies for whom it is a sensible decision to devote resources to understanding the output from Research Council funding. QinetiQ, atypically, depends on research and development for its own core business and is large enough to allocate technical staff to forging links with universities and RCs. Some technology-driven majors such as Rolls Royce and the Pharma companies also have similar resources deployed but for the vast majority of industry the initiative is likely to have to come in the other direction.

3. Many industrial partners are "attached" to proposals without sufficient commitment, involvement or expectation. The RCs could therefore be misled into believing that their connection with exploitation of technology is greater than in practice it is. Only if industrial partners have "skin in the game" by participating significantly in the work or by providing substantial funding can their serious attention be confirmed.

4. This economic realism is further supported by the introduction of full economic costs. With more experience, this will enable the RCs to value and consider the implications of their decisions, enabling better focus of national resources and hence better value for money in the short and longer term.

5. While the RCs are encouraging researchers to collaborate with business, a number of factors impede smoother interaction. Supporting knowledge transfer is a new activity so, not surprisingly, there is a lack of knowledge on all sides, approaches and mechanisms remain immature. If the intended benefits are to be achieved, swift focus on the inhibitors is essential. We suggest that the following aspects are considered when considering Council support for Knowledge Transfer:

The knowledge, skills and experience of RC staff

6. There is a national shortage of staff skilled in technology transfer and those most able are more likely to seek employment in the most remunerative sectors. Thus the Venture Capital (VC) industry, and particularly its bio-sciences subsector, tends to be a magnet for the best staff.

7. The university sector has drawn in a large number of staff in recent years and many are on a very steep learning curve. Unlike the VC industry and commercial companies, the university sector is financed largely by grant and therefore lacks the rigorous financial discipline of money that has been raised from investors. The danger is that the real costs associated with apparent successes might be disguised and therefore capital misallocated.

8. Skills can be improved by Human Resource (HR) policies such as secondments to and from industry. Of the schemes promoting knowledge transfer, the one most appreciated by QinetiQ is ICASE awards: PhDs allocated to the company part-funded by the Research Council. This scheme is simple to understand and operate, has considerable flexibility and is respected by academics, students and the company. More ICASE awards would be welcomed in preference to proliferating further schemes.

Narrow and segmented activities within and across the RCs

9. The main task of RCs is research funding which by its nature tends to be narrowly focused on topics of particular excellence. Technology Transfer opportunities tend to exist at one or two levels of aggregation above that. While there are attempts to focus funding into substantial centres of specialist expertise, greater concentration would offer critical mass, depth with breadth, larger and sustainable teams, and reduce the task of business in trying to find its way around. This is especially important for EPSRC which operates no laboratories of its own.

10. The RCs (along with other funding bodies, notably Hefce) fund significant expenditure for equipment and facilities. While investment in rejuvenating facilities is welcome, there is duplication in some areas and inefficient and subcritical utilisation elsewhere. The RCs should reconsider how and where they allocate resources, including more centralised and managed facilities—perhaps operated by Agencies or industrial companies, but with regard for the implications of travel. Some closures must be accepted in consequence.

11. Modern equipment often needs sophisticated associated infrastructure, dedicated specialist operators and technical support teams to maintain optimum effectiveness and outcomes. Integrated operations of this type are rarely available in the universities, so RCs could be achieving a poor return on their investment. Most research teams prefer to “own” their own facilities rather than share or buy capability from others. An additional and perverse outcome of the current approach is that students are not trained to access equipment and facilities elsewhere; such skills will be required in later employment.

The motivations, drivers and constraints that influence university staff when responding to RC calls for proposals in Knowledge Transfer

12. In QinetiQ’s experience researchers the world over have a common culture of “grant farming”. The key characteristic of this is that a grant requires no return which is helpful when the objective is to continue to further knowledge. Business on the other hand has an investment culture. All expenditure must be balanced by the expected return. These cultures sit against each other awkwardly in the Knowledge Transfer arena. Since there is no intention to change research culture, it might be more effective to place the leadership for Knowledge Transfer assignments with business collaborators.

13. Industry led investigations and challenges can be as demanding to complete as academic studies. Applying research requires very different skills from pushing the frontiers of science. The RCs need to recognise and ensure that people with different experiences, aptitudes and inclinations are engaged, even though such skills are in short supply and high demand. Few individuals can excel in or have time for teaching, research and knowledge transfer; each should be recognised and cultivated as a skill in itself.

Technology push versus market pull

14. Technology is very rarely the only crucial ingredient in a business venture. Value most often comes from bridging the gap between market need and new technology. In different areas of science this gap varies in difficulty to cross. Pharma companies are skilled at understanding biological and medical advances and seeing the application to medicines. Researchers in those areas are therefore “closer to market”. In physics based sciences it is rare for a single invention to unlock a market need and therefore the Knowledge Transfer task is greater.

15. It follows that if the Knowledge Transfer quotient in physics-based sciences is to equal that in the life sciences the proportion of resources devoted to the task is likely to be greater.

16. The Government’s procurement budget of over £120 billion per annum should be a powerful engine for innovation. Despite Ministers’ intentions, it has not yet become so. There are many reasons for this, but the RCs, as government funders, are well placed to stimulate and support embodiment of newer research contributions in major government procurements, involving suppliers where appropriate and working with the regions and other government departments.

The high cost of getting new knowledge into the market place

17. In promoting Knowledge Transfer, the RCs should separate more clearly their funding streams for research which is truly original, leading edge and remote from immediate application, from research that is closer to exploitation. They should ensure that applied projects have clear potential exploitation routes with proactive user involvement from the outset. Some funded activities may arouse researchers curiosity but the work is neither leading edge nor likely to be applicable.

18. The cost of transferring research outcomes into the market is very high. Intellectual property may be overvalued by universities, a “new” piece of knowledge may not add significant value for industry: in some instances it may threaten existing business, in others a new market must be created.

19. The recent emphasis on the universities’ intellectual property has not always been helpful. In particular, it has tended to encourage overambitious valuations and too many immature companies. The award of capital to new ventures must be accompanied by rigorous commercial disciplines if it is not to be misallocated.

Stakeholder engagement and communication

20. The RCs have an important role and duty in taking on difficult issues of communication and engagement in areas where individual research providers are potentially exposed. Such areas include animal experimentation, nanotechnology and nuclear matters.

21. Communication is a two-way process but much of the Research Council communication is confined to formal reporting and briefing to interested parties about their activities, through, for example, leaflets, bulletins such as Spotlight, occasional more formal or informal presentations, the web and on line electronic tools.

22. By contrast, we have seen relatively little consultation with users, and recent appointments of relationship managers are welcomed. However, calls for proposals are only sent to universities and the EPSRC “peer review college” is dominated by academics. PPARC’s PIPSS panel is well balanced, including industrialists in an even mix, and the EPSRC User Panel is also an excellent forum; but how widely known are they?

23. The RCs ask university researchers to engage companies within set timescales that are not necessarily in line with industry demands. This inevitably leads to random conjunctions, rather than longer term strategic opportunities being developed for the UK economy.

24. Students funded by the RCs are key stakeholders. Students subsequently moving into employment provide a strong mechanism for Knowledge Transfer that could be exploited better, if tracked by the RCs.

Results and performance management

25. The UK scores well in international comparisons when measured by bibliometrics. There is little doubt this is due in no small measure to the funding mechanisms linked to measurement. These have, however, been focused on the research and teaching agendas. When addressing the Knowledge Transfer agenda they have taken a simple view of what constitutes the results of their work. Statistics of grants awarded and PhDs completed have been sufficient; added value and wider benefits were rarely considered. The RCs are now considering what “outputs” they generate from their significant investments but this is still very immature. In practice, metrics for assessing the value of knowledge transfer are difficult to establish; those considered, such as numbers of industry collaborations, patents and start-up companies, do not reflect accurately the value of interactions to users and may distort adversely the behaviour of some research teams.

26. QinetiQ would favour a much more market based approach requiring a clear account of the monies invested in Knowledge Transfer and the returns earned.

27. There is also a question about metrics used in assessing the quality of research. Citation indices are often used but these are unlikely to be favourable to work in the innovation process essential to achieving Knowledge Transfer, particularly in physics based sciences. The dependence of universities on the Research Assessment Exercise for much of their funding deters academics from engaging in this work which is vital to industry. This is a serious point for the RCs who need to look for some less biased criteria.

Co-ordination between the RCs and the role of RCUK

28. There is an obvious need for coordination amongst the various funding bodies but the role of the RCUK umbrella body is not particularly visible to us.

APPENDIX 18

Memorandum from the Association of Research & Industrial Links (AURIL)

RESEARCH COUNCIL SUPPORT FOR KNOWLEDGE TRANSFER

1. The Association of Research & Industrial Links is the largest membership-based professional organisation for Knowledge Transfer practitioners in Europe and represents Knowledge Transfer professionals in higher education and related sectors, supporting their work with university stake holders who wish to access university based research and its knowledge outputs, including the UK Research Councils.

2. Since the inception of the new remit and structure for UK Research Councils in 1993, Auril has had close working relationships with both individual Research Councils including the Arts and Humanities Research Council since its foundation and as a group in order to maximise the successful generation of world-class research and of the executive transfer of knowledge from the universities for the benefit of the UK economy and the well-being of UK society.

3. In particular, AURIL has supported all Research Council initiatives which seek to develop applications or to transfer research outputs to commercial benefit recognises that the principal functions of the UK Research Councils are to foster the best research as measured by peer review and against international benchmarks but also to be responsive to the needs of their stakeholders in UK industry, charities and foundations and the wider society. In 1996 for example EPSRC conducted a university exploitation audit pilot to scrutinise the effectiveness of the exploitation process in universities in respect of UK Research Council grants. Some half dozen or so universities took part in this initiative and, as example, the University of Birmingham produced the research exploration audit process report (REAP) entitled "*People, Partnerships, Programmes*" (Feb 1997). Recommendations were made to develop the connection between research and to extend the pool of knowledge towards more ready dissemination and exploitation, recognising the key role of professional research champions in the leadership of research groups. It was proposed that allowable expenditure heads on research awards might include such items as producing demonstrator projects for industry and others, research audits of outcomes, patent costs and other associated expenditure towards exploitation. It was further suggested that research into executive case studies should be carried out, funded by the Research Councils to establish a better understanding of good practice. This might include more systematic international benchmarking as well as tracking and profiling over longer term outcomes and post graduate researchers in to the future.

4. The integrated knowledge centre initiative was supported by AURIL although it is questionable whether such developments is not more properly the province of the dept of trade and industry and whether it diverts generic research funding away from the UK research base. It is probable that more benefit would accrue in terms of commercial applications from flowing the resources through the existing link scheme which has a proven track record. On the other hand AURIL recognises the political realities in Whitehall of winning new and additional funding in Spending Reviews.

5. The main problem lies in identifying where Research Council funding has led to successful outcomes as these may not be short term or directly linked to specific research contracts. It is not easy to connect Research Council responsive mode grants to specific examples of success for knowledge commercialisation. Specific schemes, however, such as the Research Council's Business Plan competition and the Follow-On Fund have been highly successful and major benefit to UK universities, leading to transfer of successful innovations to the extent that more funding would be welcome in these programmes.

6. The role of the Research Council is directed towards more generic approaches to supporting commercialisation across the range of grants or more specific initiatives such as Faraday or KTP. It is recognised, however, that such schemes might more properly be funded through the department of Trade and Industry as is the case with the latter.

7. Since the Lambert report a clear framework has been established for guiding commercial relationships between UK universities and business. AURIL would not support further developments in particular concerning the ownership of intellectual property which threatens the autonomy of universities to pursue research at their discretion and to make commercialisation arrangements in their best interests. The Research Councils also have a relationship to their stakeholders which, in recent years, has been more fully developed via communication and consultation and in the structures by which Research Councils are managed. AURIL continues to support the engagement of UK Research Councils with all of their stakeholders including universities, but does not believe the Research Councils should move to "hold the ring" in the interface between universities and business. Whilst better liaison can be encouraged and initiatives developed the ultimate decision concerning successful examples of knowledge transfer should remain with the contracting parties.

8. More might be done by the Research Councils to provide opportunities for the collaborative working of research and business and, on a sector basis, but recognition should be given to the variety of existing initiatives which support such engagement including Link research, exchange and secondment schemes.

9. The UK is now addressing the shortage of skilled and experienced KT professionals and AURIL has played an important role in this field. The HEFCE support via the Higher Education Innovation Fund (HEIF) fund and its predecessors is greatly welcomed. As a result AURIL is leading the development of a national Institute for Knowledge Transfer and hopes that the UK Research Councils will be able to engage with this new body and to effectively support its creation and development. Only by securing the supply of skilled people at the interface between universities and business will the UK be able to ensure that knowledge transfer will be maximised. It is a combination of approaches to the development of people, partnerships and specific funded programmes through which the UK economy will prosper and the UK Research Councils have a role in fostering all three. AURIL stands ready to assist individual Research Councils or RCUK in this capacity, but recognises that there is much to commend in the approaches adopted thus far, for which the Research Councils are to be congratulated.

10. The future of the Research Assessment Exercise after 2008 and its effectiveness in fostering knowledge transfer remains a key question as does the willingness to fund through Research Council grant programme other activities designed to assist commercialisation.

February 2006

APPENDIX 19

Memorandum from Universities UK

RESEARCH COUNCIL SUPPORT FOR KNOWLEDGE TRANSFER

INTRODUCTION

1. University/industry collaborations are beneficial in a range of ways. They bring with them opportunities to commercialise existing research, to stimulate new research directions, and to generate income. They provide a means both for the efficient transfer of economically useful knowledge and for advanced training in skills needed by industry. These relationships need to be supported in a consistent, transparent and burden-free way.

2. The Lambert Review (2003) highlighted the considerable progress that has already been made by universities. The 2005 higher education business and community interaction survey (HE-BCI) shows a continuing improvement in HE-business interactions, and highlights the success of HEIs in contributing to the economy and society (their third stream strategies). The survey also shows increases in income from consultancy and UK total collaborative research income for the third year running. Substantial, permanent and consistent third stream funding for universities will allow the higher education sector to continue to build on this success.

3. Currently there are a number of organisations that support knowledge transfer from the academic sector into commerce and business, such as the Higher Education Funding Council for England (HEFCE), the Department for Trade and Industry (DTI), and the Regional Development Agencies (RDAs) as well as the European Union. It is important that the various initiatives such as the Higher Education Innovation Fund (HEIF) and Knowledge Transfer Partnerships (KTPs) are linked together coherently.

4. As Universities UK highlighted in our response to the Lambert Review, there is a lack of coherence to the support available for knowledge transfer, and there would be real value in achieving a more joined-up approach from Government and other providers. In our view the role of the research councils should be focussed on work with industry to establish areas of long-term research that will ensure future national competitiveness, and the sharing of research findings to a broad audience.

RESEARCH COUNCIL SUPPORT FOR KNOWLEDGE TRANSFER

5. Universities UK welcomes support for knowledge transfer through the research councils. The inclusion of knowledge transfer in research council objectives is an illustration of Government's recognition of the importance of the development and transfer of knowledge from the science base to support the knowledge economy.

6. We would however emphasise that this is not part of the core mission of the research councils. Their primary mission is to fund long-term research and, whilst it is important that such research is utilised and shared with academics and industry alike, knowledge transfer should primarily be supported through appropriate and consistent third stream funding (HEIF), and initiatives to support industry in collaborative working with higher education (eg R & D Tax credits). We welcome the increased budget of £238 million over two years under HEIF but would highlight that this only represents 2% of HEFCE's annual grants to higher education institutions. The third stream remains weakly supported compared to the other two streams of funding, and this should be addressed.

7. One issue that has arisen since HEIF3 (the third round of funding through this initiative) is the lack of robust metrics available to effectively measure knowledge transfer through both input and output measures. Universities UK is currently beginning work with HEFCE and the Office of Science and Technology (OST) to develop indicators for use in future rounds. A group of academic experts will consider existing metrics (for example those used by the Treasury, and by the RDAs for structural funding) with the intention of developing a set of indicators that are both robust and transparent in the lead up to HEIF in 2007. The aim will be to develop a suite of indicators which are easy to collect, legitimate, and applicable to both the public and private sector. We would encourage Government to explore how the outcomes of this project might ensure that research council activity in knowledge transfer is measured effectively, and in a way that is clearly defined and does not divert them from their core activity.

BROADER DEVELOPMENT OF RESEARCH COUNCIL ACTIVITY

8. Universities UK welcomes the modifications to the structure of the research councils over the last few years, which have sought to ensure that they are able to take a more collective and strategic approach to their business, and be more responsive to the needs of a whole range of research providers and users.

9. In addition, from our perspective, the creation of Research Councils UK (RCUK) has been a positive step. RCUK has allowed the research councils to take collective and strategic approaches to key science policy and administrative issues, and has worked to ensure a coherent and consistent dialogue with external stakeholders. This has helped UK universities link in with the research councils more effectively at a strategic and policy level. Good progress has been made in taking forward the recommendations arising from the OST review of RCUK in 2004, and the research councils should seek to continue to build on this work.

10. Reforms of the research councils that have sought to place their funding in universities on a more financially sustainable footing have also been very welcome. Universities UK has stated on many occasions that it is vital we are able to rebalance the dual support system and move towards a more financially sustainable research base in UK universities. The Government has proven their commitment to the sustainability of the science base through the additional investment provided under the last two spending reviews. This has helped considerably, particularly the commitment to meet more of the full economic costs of research council projects—up to 80%.

11. It is, however, likely that the pressures on university research departments may well increase in coming years as higher education institutions move towards implementing full economic costing and ensuring that the research base is sustainable across all activities. Universities UK feel that there is still a need for ongoing discussion between the DTI, DFES, Treasury, other government departments and funders of research on how we can continue to move towards achieving a more financially sustainable basis for all research activities. Dual support reforms have focused primarily on research council funds to date, which is only a part of the total research income in universities.

SUGGESTED FUTURE ROLE FOR GOVERNMENT

12. The role of the Government should be to incentivise and innovate, and to resolve issues such as procurement which block creativity and innovation. The Government should, in our view, seek to improve start-up prospects and encourage businesses in the UK to grow. Business support through initiatives such as R&D tax credits should be better marketed, and the process for application made less burdensome. We must also address Intellectual Property issues and continue to work to minimise the legal, financial and resource constraints involved for SMEs when collaborating with universities.

13. There is a need for further “proof-of-concept” related initiatives providing funding to applied research/ development with good commercial potential. For many years there has been a significant gap in funding to bring university research discoveries to a point where their commercial usefulness can be demonstrated and first steps taken to secure their utility.

14. The higher education sector should be regarded by Government as a major industry in its own right, and given the freedom to operate as such under a “lighter touch” approach. This will make it easier for Universities to invest and engage with business. This is especially relevant in the European context, where companies are badly affected by controls that hamper innovation. Universities UK looks to Government for a continued commitment to supporting new business-university interaction by providing increased and sustainable “third stream” funding to universities and promoting innovation which is the driver of society and the creator of wealth.

APPENDIX 20

Memorandum from Dr Ian Ritchie

RESEARCH COUNCILS AND KNOWLEDGE TRANSFER

BACKGROUND

Ian Ritchie founded a software business (OWL) in 1984 based in Edinburgh and backed by Venture Capital funds from Canover, Syntech, 3i and Scottish Development Finance. The company commercialised research work originated at the University of Kent at Canterbury. It opened its sales office in Seattle in 1985 and was sold to Matsushita (Panasonic) in December 1989. For the last 15 years he has been an active business angel, working mostly with start-up technology teams, often with research connections to academic departments, providing initial seed funding and helping them develop their management teams, their business plan, and with the process of raising their Venture Capital funding. These companies have included Voxar (sold to Barco in 2004 for £26 million), Orbital (floated in 2001 for £50 million, then merged with Sopheon), and Digital Bridges, currently Europe's leading supplier of games for mobile phones.

He has been a member of the Particle Physics and Astronomy Research Council and is currently a member of the Scottish Funding Council for Further and Higher Education. He has been a board member of Scottish Enterprise (1999–2005), and is currently a board member of the Scottish Institute for Enterprise and the Chairman of Connect Scotland, both dedicated to encouraging entrepreneurship in Scotland's Higher Education sector.

INTRODUCTION

My concern lies in the field of start-up and spin-out businesses. Occasionally, research teams in University may develop a technique or an innovation which might have commercial prospects. These will often be projects which are too underdeveloped, or too risky, or too early stage, to be of interest to established corporations, but which might be developed by a small team into a potentially commercial proposition.

It is from such start-up companies (like Google in the USA, or ARM in the UK) that tomorrow's giant corporations emerge, and so the UK needs a steady flow of spin-out businesses to create the new cutting edge businesses that add so much dynamic to the economy.

EXISTING SYSTEM

1. The UK enjoys a considerable resource in its Research base. The various funding councils, aided by the Research Assessment Exercise, have helped created an internationally competitive research community, often working at the cutting edge of new science and technology. There has, however, been regular criticism about the lack of engagement between academic research and potential commercial exploitation in the wider economy, and various efforts have been made to modify the Research Assessment Exercise to give commercialisation efforts a higher priority in the goals of research activity.

2. Research-intensive Universities gain much of their funding from the dual-funding system, where the national funding councils provide basic infrastructure funding to a formula based on RAE results, and the Research Councils provide specific funding won by competitive bids.

3. Although University research is largely funded by the state through the Funding and Research councils, the commercial exploitation rights of any research is left to the individual Universities.

4. This process is usually managed by executives in the University commercialisation department. These are often individuals who are levels below Vice Principal and who often don't feel empowered to "give away" what may be regarded as potentially valuable University property.

5. This process often results in extended negotiations between the University and the potential new company where the University asserts ownership over IPR. It may seek its return as an equity stake in the new company and/or a royalty flow from any revenues generated.

6. During this process the potential entrepreneurs are under extreme pressure. They need to settle with the University before they can attract investment from other sources. They will also be trying to attract and retain key staff for the new business and delays can often mean that these key individuals are lost. It is not unusual for the potential company to fail to agree term and to not proceed.

7. Usually, Universities will have a fairly unrealistic view of the value of a potential spin-out business. In most cases the research team will have identified a potential commercialisation area, but will not yet have a product. The spin-out team will need to create a prototype and test the market, and then it is fairly common to build a pilot for a limited distribution before a product is finally developed. It is quite usual that the final product owes little more than an "original concept" to the research team. In the meantime, they will need to build or acquire management and marketing skills. The IPR value of the original idea will often be quite modest.

RECOMMENDATIONS

1. In most cases, start-up businesses do not represent a meaningful potential source of revenue for Universities. The economy as a whole would be best served if start-up companies were positively encouraged to spin-out, and not constrained by the unrealistic expectations of commercialisation departments.
2. Universities are very oriented to financial reward. If you wish them to behave in a particular way, it is best to find a funding method that will achieve this. This is the lesson of the RAE system.
3. A new scheme should be developed which would encourage such businesses to be created in as quick and easy a process as possible. It should be in the interest of Universities to see as many of such companies succeed as possible.
4. I propose a scheme which would reward start-up businesses which spin-out of a University with a bounty, paid for each graduate the company employs over its first five years.
5. This is similar to the bounty paid to inward investment companies, but these ones would have the benefit that most of them would become heavily embedded in the local economy and because they will employ skilled graduates doing knowledge intensive work, they will not be subject to transfer abroad later (unlike many historic inward investment projects).
6. If there was a £10k bounty to be paid for each graduate job created over the first five years, split 50/50 between the University and the company, a company which employs 50 graduates in its first five years would attract a £250k grant to the company and a £250k grant to the University.
7. This would ensure that University commercialisation departments would concentrate on encouraging knowledge transfer, and would begin to work towards making sure that these companies succeed, such as helping with building management teams.
8. This scheme would only be applicable where the University waives ownership of equity or royalty (perhaps a token 5% equity might be permitted). If the University believes that the IPR is significantly more valuable, they would retain the right to negotiate alternative deals. This would ensure that valuable IPR can still be properly rewarded.

March 2006

APPENDIX 21

Supplementary evidence from Professor Diana Green

SUPPLEMENTARY WRITTEN EVIDENCE ON THE KNOWLEDGE TRANSFER RESPONSIBILITY OF THE RESEARCH COUNCILS

First, I would like to make some general points. I will then make some specific points drawing on my experience of Yorkshire Forward.

GENERAL POINTS

To echo the point made by Sir Keith O’Nions, the RDAs are different in scale (including the scale of funds at their disposal) and in the extent to which they get actively involved in KT. He quoted two examples of active engagement; the NW’s involvement in Daresbury (which involves the Research Councils (RCs), especially the CCRC) and the Harwell/Radford/Appleton/South Oxfordshire’s engagement with the same set of RCs and SEEDA. History is important here. It is worth remembering that it was the dispute over the location of the new synchrotron (now being built at the Harwell-Chilton science campus) which kick-started the NW RDA’s involvement in this area. Indeed, the decision to build it in Oxfordshire rather than at Daresbury prompted the NW RDA to commission a major study of the NW’s science base which in turn led to the establishment of the Science Council.

David Sainsbury then decided that the Science Council model was a good idea and the RDAs were instructed they should all develop one, based on the NW model. It has taken some time for these to be established. Indeed, Yorkshire Forward’s version, “Yorkshire Science” is still relatively new (launched in May 2005) and has recently lost its Chairman (who is relocating to the US). The point is that the NW RDA got into the development of science and innovation at a very early stage, prompted by the very real concerns about the potential impact of the loss of key science expertise on the regional science base. At the same time, the structure of the NW region’s industrial and university base facilitated the establishment of a high-powered Science Council chaired by a very prominent industrialist. Since then, the determination to create a “world-class” university at Manchester and the investment this has attracted (in addition to world class provision within other universities in the region), together with a fair political wind has helped build critical mass (potentially if not yet actually) as a counterweight to the concentration of research and innovation in the south east.

BARRIERS

1. While in principle, all of the regions have recognised the important contribution that universities can make to economic development, in respect of R&D, innovation, and advanced level skills, in practice, the extent to which this has translated into collaborative action is hugely variable. This is partly to do with the ratio of HEIs to RDAs and the budgetary capacity of the latter. It is also partly to do with the extent to which it has taken some RDAs time to work out how best to deploy HEI expertise to achieve their economic development objectives. Yorkshire Forward for example understood that the majority of R&D in the region was carried out in the universities but could not work out either what to do to stimulate innovation and enterprise in the business sector or how best to harness and utilise the capacity in the universities to help develop and deliver key elements of the RES.

2. Undoubtedly, one major constraint in respect of many of the RDAs in this whole area was and is a people constraint; that is, having the right skills and competences to develop and deliver strategies designed to strengthen the region's economic base (including its science base). This is true of both the staffing of the organisations and the establishment of the Science Councils. In the early days, many of the RDAs outside of the South East were staffed by civil servants (from Government Offices, EP and the like) who had little if any understanding or experience of innovation and enterprise. In the case of Yorkshire Forward, it took some time before they appointed staff with a track record in this field. Since then, there has been significant progress and the establishment of initiatives like the CIC initiative (Centres of Industrial Collaboration, see below) is a good example of where the RDA has discovered and put into place a successful mechanism for increasing HE-business interaction and transferring innovation (of products and processes) in key industrial sectors. The related people constraint seems to be a product of the structure of the regional industry; in Yorkshire and the Humber, the relatively small number of major national or global companies with their head office in the region has been a constraint on forming a robust Science Council.

3. Mismatch between funding streams and objectives. Initially, a major barrier to RDAs successfully engaging in the area of KT and innovation was the rigidity of their funding streams and associated metrics and the bureaucracy associated with their interventions. For example, many income streams especially those that were married up with European funding focused on jobs created/saved rather than improvements in business related performance indicators (market share, bottom line performance etc). There has been some improvement. But the RDA interventions share with those of other agencies operating in the KT area similar weaknesses (explored by the Committee in the session I attended) relating to both the complexity, fragmentation and inconsistency of multiple intervention mechanisms and the general weakness of output metrics able to measure economic impact in the longer term.

4. Politics versus effectiveness: in the case of Yorkshire Forward, the success of its interventions in general has been characterised by a tendency to give a higher weighting to sub-regional politics than to regional strategic development. This is evident in the delivery of its strategy in relation to designated key industrial clusters. To take one example, rather than attempting to facilitate and steer the establishment of critical mass in the digital technologies cluster in one or at the maximum two regional locations, internal competition has been encouraged at a sub-regional basis (eg three locations in South Yorkshire competing with other elements of the cluster in West Yorkshire). This could be interpreted as a further example of the technical weakness of the staff in understanding how and where to focus interventions in relation to the longer-term sustainable development and growth of key sectors. This underlines the need for a robust Science Council (to advise on the science and innovation framework) but, as indicated above, gives some cause for concern at the level of implementation.

RECENT SUCCESSES

Yorkshire Forward has made strenuous efforts to increase its capability in both revising its RES and potential implementation plans. One development is the recognition that universities are not simply or mainly supplicants seeking access to funds but potential business partners. What this will mean in practice is at present unclear but a major effort is being made to understand the differences and strengths of the different universities and their potential contribution to the delivery of the new RES. I will quote three examples here of this apparent change of direction:

- The launch of the CICs (Centres of Industrial Collaboration). The aim of these is: *“to provide and develop a world class scientific, technical and research resource for the Yorkshire and Humber industry which will transfer knowledge to regional companies, encourage investment by UK and international companies in the region and promote Yorkshire and the Humber as an emerging force for technology and innovation.”* They act as a focal point for industry-university collaboration focused on the needs of Yorkshire Forward's five strategic industrial clusters: Advanced Engineering and Metals; Biosciences; Chemicals; Digital Technologies; Food and Drink. There are currently 14 CICs; the entry ticket for a university is RAE rated research of at least grade 4. Yorkshire Forward provides £600k per CIC over a three year period.

Sheffield Hallam University has two CICs: MARS (Materials Analysis and Research Services) and Design Futures. MARS has, inter alia, led the development of a new drill coating allowing fast, accurate and cost effective high speed drilling (used by Airbus Industries). It has also pioneered,

with a local silver manufacturer, Carrs of Sheffield, the world's first non-tarnishing sterling silver in a breakthrough that is expected to revolutionise the silver industry (and should reduce the need for storing abrasive and dangerous chemicals in the home).

- In a venture that could be seen to parallel the synchrotron battle in the NW, Yorkshire Forward is backing the development and location in Yorkshire of the European Spallation Source. This is a major European investment project and various European Governments are competing to be the host location. Yorkshire Forward has been lobbying the DTI and other Government Ministries to push for the location to be based in the UK and in Yorkshire. This is a major strategic project not only for Yorkshire Science but if successful for UK science. It is the one example in my response which parallels the NW/Oxford example insofar as it involves central departments, RCs and the RDA.
- The third example is Yorkshire Science. The remit and objectives of the first three years are very clear. The task is a challenging one: to exploit science and corporate investment in R&D as a key to improving competitiveness and productivity. The revised RES recognised the contribution of the universities to the Y&H economy and suggested they should be placed at the heart of economic development. It also pointed out that although levels of R&D intensity in the universities are strong, it needs to be better linked with businesses where R&D investment is the second lowest in the UK. The composition of the Council underpins this aim, bringing together representatives from the business community (6), two Vice-Chancellors, representative for the UK RCs and the Chief Executive of the Central Science Laboratory. Given that this is a relatively new body (2005), it is too early to speculate on either its effectiveness or impact.

Note: One potential weakness of the Science Council model is the tendency to focus on science (including bioscience) and engineering and to exclude R&D in other key sectors, including the digital and creative industries. This problem, compounded by the boundaries between the DTI and DCMS, may become less significant given the establishment of the AHRC.

CONCLUDING THOUGHTS

I would like to close with a few additional thoughts. I shall depart from my UUK brief which tells me I should stress that it is vital that the RCs do not become too removed from their primary role—the funding of long-term research and that the sector would not wish to see the RCs move into areas of KT being supported by other organisations. I think this is a false and misleading dichotomy. I feel much more sympathy with Ian Diamond, chair of RCUK who, writing in the Guardian newspaper on Tuesday 7 March about the role of the RCs in ensuring that research has maximum impact, said:

“... Won't this goal distort priorities away from blue-skies research? ... The answer [is] “No”, but we will need to step up our existing KT activities and make them increasingly sophisticated. This is a priority for the RCs, for whom one task is to leverage R & D funding in the private sector. We do this through collaborative research programmes. To suggest that the emphasis on KT will mean funds are diverted from blue-skies research betrays an ignorance of the process and of the needs of users.”

And in a general sense I would argue strongly for four things:

- (a) There is a need for more “proof of concept” related initiatives providing funding for applied research and development with good commercial potential (success in HEIF2).
- (b) A more joined up approach by Government to KT strategy and policy and its delivery, and one which in particular builds on the success of current schemes but does so in a more coherent framework.
- (c) An approach which, as far as HE is concerned, recognises the latent capacity within universities to play a major role in delivering the economic and business transformation that KT potentially offers. In this respect, we welcome important initiatives like HEIF which have helped Vice-Chancellors persuade their staff that that “third stream funding” is as important and legitimate an activity as T and academic R. However, frankly the financial and reputational rewards associated with this activity pale into insignificance when set against the impact of the RAE. In my view, the spectrum of the RCs responsibilities from funding speculative blue skies research to leveraging R&D funds from the private sector is very helpful to Vice-Chancellors who want to win hearts and minds in this respect. So we are looking to Government for a continued commitment to supporting business-university interaction by promoting innovation and providing increased and sustainable” third stream funding”
- (d) Metrics: one area of common interest between the Government, the RCs, the universities and their partners is an interest in robust and reliable metrics. As the recent HEIF3 competitive bidding exercise demonstrated, universities and funding bodies tend to measure the measurable, with an over-emphasis on inputs and process. Outputs and impact—particularly long-term and sustainable impact is much harder both to define and measure. I was pleased to hear Sir Keith O’Nions indicating that he has commissioned work in this area.

Finally, can I repeat my suggestion to you that Committee members might gain a better understanding of the interaction between the speculative and KT aspects of Research Council interventions if they visited a number of universities to see how this operates on the ground. In this respect, may I re-confirm my invitation to you to visit Sheffield Hallam University for this purpose.

March 2006

APPENDIX 22

Supplementary memorandum from Research Councils UK

LETTER TO RESEARCH COUNCILS UK

As part of the House of Common Science and Technology inquiry into Research Council Support for Knowledge Transfer, it has been decided to evaluate three specific Research Council schemes in this area. We would therefore be grateful if you could obtain and send information regarding inputs and outcomes for the following schemes:

1. RCUK Business Plan Competition²⁰ (since 2001).
2. CASE Studentships (since 2000).
3. NERC Connect A & B (since 1996).

1. *Business Plan Competition*

For the Business Plan Competition, the Committee would like to evaluate the overall cost of the scheme against its full output (ie in addition to the number of prize winners). We would therefore like information on the following:

- The total cost of the scheme since its inception, both indirect and direct, including such items as:
 - (i) the cost of awards;
 - (ii) the source and size of any industry sponsorship, money or otherwise and
 - (iii) staffing and advertising costs.
- The direct impact of the scheme, as indicated by data such as:
 - (i) the number of entrant companies;
 - (ii) their home institution;
 - (iii) the number of qualifiers at each stage of the competition;
 - (iv) the subsequent activities of entrants—both entrant companies and the individual members, including those who were not awarded prizes (eg how many subsequently went on to exploit their inventions and/or made use of what they learnt during the competition).
- The indirect impact of the scheme as best as it can be ascertained through available information, including:
 - (i) formal feedback from participants, home institutions, sponsoring or attending companies and judges; and
 - (ii) informal feedback from the above stakeholders or other observers.

2. *CASE Studentships*

The Committee would like to determine the annual cost (since 2000) to the UK Government and host companies of the scheme. It would be grateful to receive information as follows:

- (i) the cost of awards (broken down by Council and sector of Industrial Partners); and
- (ii) numbers of awards per Council.

The Committee would also like to receive data indicating the impact of CASE since 2000, in response to the following questions:

- (i) how many CASE students have gone on to work in the industrial research sector (and of those, how many were hired by their host companies)?;
- (ii) how many have gone on to work in the academic research sector?;
- (iii) how many students have left research to undertake employment in other sectors?

The Committee also wishes to assess any additional areas of impact. What information is kept on the nature of any continuing relationships or further collaborative work generated by the scheme?

²⁰ Also known as the Joint Research Council Business Plan Competition.

Finally, the Committee would also like information on:

- (i) whether there any significant differences between different Research Councils in the way the scheme is administered, including evaluation methods?;
- (iii) satisfaction rates for the Studentships, in respect of the host companies, institutes and students themselves?.

3. *Connect A & B/Partnership Research Grants*

The Natural Environment Research Council has been running these schemes since 1995–96. Connect B has been replaced by Partnership Research Grants. The Committee would like to see information that will help to answer questions such as:

- how many applications have been received for each scheme per annum; and what advertising is undertaken to promote the schemes to research bodies and industry?;
- how many grants have been made each year, and what was the total value?;
- what were the total annual costs of running the schemes? and
- what steps are taken to measure the effectiveness of these schemes in supporting knowledge transfer?

Due to the short timeframe of the Committee inquiry, it would be appreciated if you could supply the relevant information by the 19th April. Please do not hesitate to contact me if you have any queries.

April 2006

RESPONSES

HOc S&T COMMITTEE INQUIRY INTO RESEARCH COUNCIL SUPPORT FOR KNOWLEDGE TRANSFER: BUSINESS PLAN COMPETITIONS (APRIL 2006)

Background

1. The Research Council (RC) Business Plan Competition (BPC) aims to both assist in the creation of new business ventures from the research base and raise awareness of research commercialisation issues and opportunities amongst academics. The 2005–06 RC BPC is the first to involve all eight RCs. This Competition builds on the success of earlier pioneering bioscience competitions initiated in 1999 by BBSRC/MRC and subsequent competitions involving various councils.

2. The aims of the RC BPC are:

- to encourage public funded researchers to consider the exploitation of research;
- to provide training to make publicly-funded researchers more aware of the key issues for commercialising research outputs;
- to assist knowledge transfer by facilitating the development of spin out companies, viable business services, joint ventures and licensing agreements.

3. The Competition is open to public-funded researchers working in universities, PSREs and all other institutions eligible to receive support from the research councils. The researchers should be working within the remit of the sponsoring councils. The Competition is open to individuals or teams of researchers, postdoctoral workers and PhD students. It is expected that the plans submitted propose business ventures that contribute to the UK economy.

4. The format of the BPC is as follows:

- One-page Expressions of Interest requested;
- *Round 1:* Eligible entrants invited to attend a two day training workshop covering commercialisation issues;
- Teams submit a five-page outline business plan which is assessed by a panel of external judges;
- *Round 2:* Successful teams benefit from a mentoring and coaching network, before preparing a full business plan to be assessed by external judges;
- Around five teams invited to compete in a high profile Final.

5. The current Competition was launched in October 2005, with the Final planned for December 2006.

Scope and Impact

6. Summary information on the scope, including costs, and impact of all RC BPCs organised to date is attached at Annex 1.

7. BBSRC/MRC obtained significant industrial sponsorship for the Bioscience BPCs (£250k for the first one alone, including donation from the Gatsby Charitable Foundation for training elements of the competition) with additional support from DTI. Subsequent competitions have attracted further sponsorship. However, the most impressive form of sponsorship has been the BPC's ability to attract in kind support from mentoring organisations involved in Round 2 of the competition, and from external judges, guest speakers etc. For instance, the 41 teams progressing to the mentoring stages of the 2003–04 Joint RC BPC benefited from 143 mentoring days provided by 27 companies, an invaluable resource and of real value to participants in developing robust and professional business plans.

8. Case studies highlighting the outputs from past BPCs can be found at Annex 2a & b. (not published).

9. In relation to impact, BBSRC commissioned an external evaluation of the first two Bioscience BPCs: "Bioscience BPC: report on commercial activity of participating teams". The review showed that there were ten companies established as a result of first two Bioscience BPCs, having raised collectively £2.3 million investment. Also, two companies launched following BPC subsequently secured SBRI funding totalling £400k. The full report is available upon request. A follow-up Review has recently been commissioned in order to track bioscience entries to the first two Bioscience BPCs and the first Joint RC BPC.

It should be noted that evaluation and follow-up monitoring is an integral component of the current Joint RC BPC and will feed into plans for any future competitions. However, it is too early to assess the impact of the first Joint RC BPC and therefore limited information is available at this time.

10. The following comments from the Bioscience BPC Review indicate the impact of the BPC on participants:

"I would not have set the company up, but for the Business Plan Competition."

"The competition has had a definite knock-on effect in terms of stimulating my colleagues to look at commercialising their work."

"The Competition gave me the ability to approach companies with confidence in a way that it could only have dreamt of before."

"The Competition was extremely well organised, with just the right number of meetings. Having a coach to talk issues through with and to help make sense of things was immensely valuable."

"I had had the idea for some time and the Competition was the stimulus for me to give it a go."

For the current Joint RC BPC, illustrative comments relating to the Round 1 training workshops alone include:

"I liked the programme and learnt a lot. Though I have attended a few workshops on business plans, entrepreneurship & commercialisation of technology, I have no doubt in saying that yours is a very balanced approach to theory & practice (case studies & Belbin exercises). In addition, the delivery by each member of your team was excellent."

"I thought the RC business plan competition was excellent and I am looking forward to writing the five page business plan over the coming weeks. . . . Hope to see you again at the next round."

"I would just like to thank you and all your team for an excellent learning experience. I have learnt a lot and will hopefully be able to apply this in various ways."

11. There are many positive examples of the indirect impact the BPCs have had on "stakeholders". One such example is documented in the House of Commons S&T Committee uncorrected oral evidence session of 29 March 2006 on RC support for Knowledge Transfer, Q162 by Dr Malcolm Skingle, GSK; "BBSRC started the bioscience business competition. I always say when those business plans first came out my mum could have done a better job. In the early years of the competition many of the business plans were of poor quality but through iterations with external advisers within the business competition the quality has improved and now, at GSK, we interact with the companies that are coming out of the competition. It has been successful and other Research Councils are now also sponsoring it. I see that as a positive thing."

ANNEX 1: HoC S&T COMMITTEE BUSINESS PLAN COMPETITIONS (APRIL 2006)

	1999-2000 Bioscience BPC	2001-2002 Bioscience BPC	2000-01 Environmental BPC	2001-02 "Joint" RC BPC	2003-2004 Joint RC BPC	2005-2006 Joint RC BPC
Research Councils involved	BBSRC/MRC	BBSRC/MRC	NERC	ESRC/EPSRC/NERC/PPARC	All 7 RCs and AHRB	All 8 RCs
Total cost of the scheme	£217k £40k	£231k £50k	£113k £25k	£217k £45k	£30k £65k ¹	£30k Not yet finalised.
Cost of awards ¹						
Source and size of any industry sponsorship, money or otherwise:	£250k GlaxoWellcome, Gatsby	£13k GSK ² , £13k AstraZeneca, £30k DTI	£30k Gatsby	£35k Gatsby, £10k Barclays Bank	£50k DTI	Currently being sought
Cash sponsorship	In addition to numerous judges, advisory group members etc., around 25 companies / professional service providers participated in the mentoring network, giving time for free.	In addition to numerous judges, advisory group members etc., around 24 companies / professional service providers participated in the mentoring network, giving time for free.	Estimated value of mentoring support from professional service providers and other companies £150k	Estimated value of mentoring support from professional service providers and others £185k	In addition to numerous judges, advisory group members etc., 27 companies participated in the mentoring network, committing 143 days time for free.	Currently being sought
In kind sponsorship						
Staffing and advertising costs	Estimate of direct staff costs £8.5k. Marketing £20.5k (includes website design and construction)	Estimate of direct staff costs £8.5k. Marketing £5k	Costs unknown	Costs unknown	Staff costs unknown. Marketing £7k.	Direct staff costs budget £29.5k. Marketing £7.5k (includes microsites).
Direct impact of the scheme						
Number of team entrants/qualifiers at each stage of the competition:						
Expressions of Interest	59	44	29	57	173 ⁴	138
Invited to participate in Round 1 (training workshops)	59	44	29	53	101	110
Individuals benefiting from training at workshop	Over 100	64	60	138	127	123
Submitted 5 page outline	32	33	14	37	90	n/a
Invited to participate in Round 2 (coaching and mentoring)	16	17	14	37	41	n/a
Submitted full plan	16	17	13	30	34	n/a
Finalists	5	6	5	5	5	n/a
Home institution (breakdown of university/institute participation)	35 universities/6 research institutes	26 universities/4 research institutes	Unknown	30 universities/5 research institutes	44 universities/5 research institutes	43 universities/4 research institutes
Subsequent activities of entrants eg successful exploitations—both entrant companies and the individual members, including those who were not awarded prizes (eg how many subsequently went on to exploit their inventions and/or made use of what they learnt during the competition)	Independent review in 2003 "Bioscience BPC: report on commercial activity of participating teams". In summary, ten companies established as a result of first two Bioscience BPCs, having raised collectively £2.3M investment. Also, two companies launched following BPC subsequently secured SBRI funding totalling £400k. The potential lifetime value of the licence deals and contracts negotiated to date by respondents is estimated by them to run in to several, perhaps tens, of millions of pounds, although such estimates clearly have to be treated with caution at this early stage. [Full report available upon request]	Of the 13 teams submitting a full plan, 12 went on to implement their plan. By January 2002, 7 had either started a business or made a significant development to existing business; 5 of the businesses had generated income. 2 had attracted private sector investment; the businesses were employing a total of 8 full time and 3 part-time staff.	In 2003, an informal follow-up survey of 15 of the 30 teams submitting full plans, suggested that 12 were in the process of implementing their plan. These include the winners Critical Pharmaceuticals, a successful VC-funded company (www.criticalpharmaceuticals.com).	Case studies of finalists can be found at Annex 2 and www.rcuk.ac.uk/innovation/bpc/bgnd.asp. Plans to evaluate this BPC in development.	Plans to evaluate this BPC in development.	
Indirect impact						
Formal feedback from participants, home institutions, sponsoring or attending companies and judges	Independent review in 2003 "Bioscience BPC: report on commercial activity of participating teams". Researchers reported that the competitions have had a significant enhanced understanding and awareness of what is needed in order to build a robust and sustainable bioscience. Ninety-five per cent of respondents believe that the competitions have better equipped them to identify research outputs with commercial potential. Ninety per cent of respondents (including those who have decided against commercially exploiting their idea and those who are still trying to do so) regard commercialisation as a more attractive proposition as a result of entering the BPC. [Full report available upon request]	All feedback received was very positive. Evidence can be provided.	Feedback was positive.	Feedback received was very positive. Evidence can be provided.	Clearly too early to assess impact, although feedback from training workshops alone has been very positive. Evidence can be provided.	
Informal feedback from the above stakeholders or other observers	Many examples of positive feedback, exemplified by comments such as those documented in the House of Commons S&T Committee uncorrected oral evidence session of 29 March 2006 on RC support for Knowledge Transfer; Q162 Dr Malcolm Skingle, GSK: "BBSRC started the bioscience business competition. I always say when these business plans first came out my mum could have done a better job. In the early years of the competition many of the business plans were of poor quality but through iterations with external advisers within the business competition the quality has improved and now, at GSK, we interact with the companies that are coming out of the competition. It has been successful and other Research Councils are now also sponsoring it. I see that as a positive thing."					
¹ Includes cost of finalist prizes but does not include grant (£4k for Bioscience BPCs; £1k for Joint RC BPCs) to each successful Round 2 team to aid access to coaching and mentoring network. Participants' travel also omitted.						
² Large number of AHRB entrants were ineligible						

House of Commons Science and Technology Committee Inquiry into Research Council Support for Knowledge Transfer 2006

In a letter dated 5 April 2006 the House of Commons Science and Technology Committee requested information in relation to CASE Studentships as set out in table one below.

In response to this request information relevant to each Council is attached at Annexes 1–8.

Table One—Information requested by House of Commons S&T Committee

The Committee would like to determine the annual cost (since 2000) to the UK Government and host companies of the scheme. It would be grateful to receive information as follows:

- (i) the cost of awards (broken down by Council and sector of Industrial Partners); and
- (ii) numbers of awards per Council.

The Committee would also like to receive data indicating the impact of CASE since 2000, in response to the following questions:

- (iv) how many CASE students have gone on to work in the industrial research sector (and of those, how many were hired by their host companies)?;
- (v) how many have gone on to work in the academic research sector?; and
- (vi) how many students have left research to undertake employment in other sectors?

The Committee also wishes to assess any additional areas of impact. What information is kept on the nature of any continuing relationships or further collaborative work generated by the scheme?

Finally, the Committee would also like information on:

- (i) whether there any significant differences between different Research Councils in the way the scheme is administered, including evaluation methods?;
- (iii) satisfaction rates for the Studentships, in respect of the host companies, institutes and students themselves?.

Annex 1

Arts and Humanities Research Council

INFORMATION ON AHRC COLLABORATIVE DOCTORAL AWARDS

INTRODUCTION

The AHRC's Collaborative Doctoral Awards (CDA) scheme was launched in 2004, and the first cohort of CDA students took up their awards in October 2005. At the time of writing, the second round has just been completed, and that cohort of students will take up their awards in October 2006. The scheme is thus at an early stage of its development, which limits some of the information available for report.

1. Cost to AHRC of collaborative doctoral awards

<i>Financial year</i>	<i>CDA awards cost to AHRC</i>	<i>Cost to collaborating organisations</i>
2005–06 (actual)*	£395,000	£43,000
2006–07 (actual and projected commitments)	£1,160,000	£52,000

* NB this represents six months spend, as the first awards were made in October 2005.

- The cost to the AHRC consists of the amounts paid in student awards, tuition fees, research training and similar costs;
- The cost to the collaborating organisation consists of the contribution made by the collaborating organisation to the student. Other costs to the collaborating organisation (staff time, provision of resources etc) are not included.

2. Number of AHRC collaborative doctoral awards

<i>Academic year</i>	<i>New CDA awards</i>	<i>Number of new CDA students</i>	<i>Stock of CDA students</i>
2005–06	41	43	43
2006–07	49	52	95

- A number of CDA awards are made each year to support two students concurrently, and a number are also made to support three-year programmes, in which studentships will be offered over a period of three years.

<i>Collaborating organisations by sector</i>	<i>2005–06 awards</i>	<i>2006–07 awards</i>
National museums and galleries	13	15
Regional and local museums	6	7
Libraries and archives	5	3
Heritage	5	7
Archaeology	1	—
Commercial	2	—
Theatre/Performance/Drama	3	5
Film	—	1
Media/Arts/Design	4	5
Legal	—	2
Health/Social/Local government	2	4
Total	41	49

3. *Impact of CDA scheme and CDA student destinations*

The first cohort of AHRC CDA students will complete their PhD in 2008 at the earliest, so no data on career destinations is currently available.

4. *Continuing relationships or further collaborations generated by scheme*

Again, the CDA scheme is at too early a stage for such information to be available.

5. *CDA scheme administration*

The AHRC's Collaborative Doctoral Awards scheme was launched in 2004 to encourage and support partnerships and research collaboration between higher education institutions and non-academic organisations in support of students undertaking doctoral student in the arts and humanities.

The aims of the scheme are:

- to encourage and develop collaboration between HEI departments and non-academic bodies.
- to establish links that can have benefits for both collaborating partners, providing access to resources and materials, knowledge and expertise and which also provide social, cultural and economic benefits to wider society.
- to provide opportunities for PhD students to gain first hand experience of work outside an academic environment, with the student supported by both an academic and non-academic supervisor, and to enhance the employment related skills and training a research student gains during the course of their award.
- to encourage collaborations from any area within the AHRC's subject remit and with a full range of organisations, bodies and businesses, including the creative, cultural and heritage industries, both large and small, across the private, public and voluntary sectors.

Applications to the scheme are made in December each year by the relevant academic department in partnership with a collaborating organisation. Those partnerships successful in being allocated one or more collaborative studentships are then responsible for appointing appropriately qualified research students, and for informing the AHRC of such appointments. The Council applies the same eligibility criteria in terms of the student's residence and academic qualifications as are applicable in the annual open competition for doctoral awards.

Applications are assessed by members of the AHRC's standing postgraduate panels during January each year; the AHRC's Postgraduate Committee then makes the final decisions in February about which applications are to be supported.

The AHRC requires the completion of an annual progress report each summer by the student and both the academic and collaborating supervisors.

6. *Satisfaction rates for CDA studentships*

No information is currently available, but student feedback will be collected from the annual reports sent to the CDA students and their academic and collaborating supervisors, and collated once the first CDA studentships are completed.

House of Commons Science and Technology Committee Inquiry into Research Council Support for Knowledge Transfer 2006

Biotechnology and Biological Sciences Research Council

BBSRC INFORMATION REGARDING CASE STUDENTSHIPS

1. Cost of Awards to BBSRC and host companies since 2000

Overall expenditure on CASE awards is as follows:

<i>Financial Year</i>	<i>BBSRC Expenditure (£k)</i>	<i>Company Expenditure* (£k)</i>
2000–01	7,370	2,496
2001–02	8,210	2,527
2002–03	8,060	2,348
2003–04	8,100	2,348
2004–05	8,900	2,328

* The calculation of Company Expenditure is based purely on the direct financial contribution required from the company to the student (£2.5k stipend enhancement), and to the university department involved (£1.4k to cover additional research costs). It does not include, for example, staff time at the host company, or the costs to the company of providing placements or additional training.

Sector of industrial partner: a recent survey of companies involved in BBSRC CASE schemes in the period 2001–03 showed the following breakdown:

<i>Sector</i>	<i>%</i>
Agriculture	14
Biotech	14
Chemical	6
Environmental	1
Food	10
Healthcare	7
Miscellaneous	3
Pharmaceutical	38
Tools	6

The breakdown for current PhD CASE students is not available, but we have no reason to think that it would vary significantly from the above.

2. Number of Awards since 2000

<i>Financial Year</i>	<i>Total CASE awards</i>	<i>New starting CASE awards</i>	<i>Total BBSRC Studentships</i>
2000–01	640	232	1,920
2001–02	648	210	1,910
2002–03	602	176	1,879
2003–04	602	188	1,926
2004–05	597	196	1,873

3. Data on the impact of CASE since 2000

BBSRC does not collect first destination data on students completing studentships broken down by CASE and standard PhD awards. The following data shows the breakdown of first employment destination across all studentships, as returned annually to OST:

<i>Year degree started</i>	<i>1997–98</i>	<i>1998–99</i>	<i>1999–2000*</i>
Total number of leavers	612	589	526
of which, destination known	537	543	322
Known destinations	%	%	%
Permanent academic employment	1	1	5
Fixed-term academic employment	38	39	31
Further training (excl. teaching)	2	2	2
School teaching or teacher training	2	3	2
<i>Private sector, industry or commerce</i>	<i>24</i>	<i>21</i>	<i>17</i>
Government or other public sector	5	8	12
Other employment	4	2	1
Not employed	9	6	17
Overseas	15	18	12

* Data collected on behalf of all research councils by HESA

4. *Additional Impact*

BBSRC does not have data available on any additional types of impact.

5. *Differences between how Councils administer schemes*

BBSRC uses three main schemes to support CASE studentships, in order to target its support for industrial research training and for collaboration between universities and companies. Each scheme is based on funding being awarded on a competitive basis to ensure that BBSRC is supporting the highest quality training for students. Applications to all three schemes are assessed by BBSRC's Studentships and Fellowships Panel, which includes industrial representatives. The schemes are:

Industrial CASE studentships: an annual competition aimed primarily at SME's. The company itself takes the lead in identifying a suitable academic partner and the project which it wishes to pursue, and for submitting the application.

CASE Partnership awards: in this scheme, major UK-based life-science based companies which have demonstrated a previous strong commitment to CASE are invited to apply for 'quotas' of studentships. The applications are assessed on the basis of the training programme which the company can provide and its policies for academic collaboration. Quotas are awarded to cover three years of student intake, in order to provide a good planning horizon for the company.

Quota CASE awards: BBSRC's main studentship competition, the Quota competition, awards studentships to university departments on a competitive basis, and around $\frac{1}{3}$ of these awards will be earmarked as needing to be CASE studentships. The academic partner takes the lead in identifying a suitable academic partner and agreeing the project to be pursued by the student.

6. *Satisfaction Rates for the Studentships*

BBSRC does not routinely collect information on satisfaction rates.

Annex 3

Council for the Central Laboratory of the Research Councils

CCLRC do not fund CASE studentships direct. However CCLRC supports CASE studentships as the industrial partner. Data on this will have been incorporated into the other Research Council expenditure on CASE.

Annex 4

Engineering and Physical Sciences Research Council

Table A
EPSRC EXPENDITURE ON CASE

EPSRC INDUSTRIAL CASE

<i>FY</i>	<i>Taken-up</i>	<i>Award duration in years</i>	<i>Unit cost £</i>	<i>Minimum Industrial Contribution</i>	<i>EPSRC Budget forecast £</i>	<i>Notional cost to industrial partners</i>
2001–02	233	3	£38,129	£4,400	£8,884,057	£1,025,200
2002–03	242	3	£39,175	£13,058	£9,480,350	£3,160,117
2003–04	318	3	£44,700	£14,900	£14,214,600	£4,738,200
2004–05	323	3	£48,257	£16,086	£15,587,011	£5,195,670
2005–06	257	3.5	£59,464	£19,821	£15,282,248	£5,094,083

CASE FOR NEW ACADEMICS

<i>FY</i>	<i>Taken-up</i>	<i>Award duration in years</i>	<i>Unit cost £</i>	<i>Minimum Industrial Contribution</i>	<i>Cost to EPSRC</i>	<i>Notional cost to industrial partners</i>
2001–02	72	3	£38,129	£4,400	£2,745,288	£316,800
2002–03	95	3	£39,175	£4,400	£3,721,625	£418,000
2003–04	77	3	£44,700	£4,400	£3,441,900	£338,800
2004–05	92	3	£56,892	£4,400	£5,234,064	£404,800
2005–06	84	3.5	£59,464	£19,821	£4,994,976	£1,664,992

EPSRC MATHS CASE

<i>FY</i>	<i>Taken-up</i>	<i>Award duration in years</i>	<i>Unit cost £</i>	<i>Minimum Industrial Contribution</i>	<i>Cost to EPSRC</i>	<i>Notional cost to industrial partners</i>
2001–02	21	3	£38,129		£800,709	£800,709
2002–03	29	3	£39,175		£1,136,075	£1,136,075
2003–04	20	3	£44,700		£894,000	£894,000
2004–05	20	3	£48,257		£965,140	£965,140
2005–06	20	3.5	£59,464		£1,189,280	£1,189,280

COLLABORATIVE DOCTORAL TRAINING GRANT

<i>FY</i>	<i>Taken-up</i>	<i>Award duration in years</i>	<i>Unit cost £</i>	<i>Minimum Industrial Contribution</i>	<i>Cost to EPSRC</i>	<i>Notional cost to industrial partners</i>
2001–02	114	3	£38,129		£4,346,706	£0
2002–03	190	3	£39,175		£7,244,510	£0
2003–04	187	3	£44,700		£7,325,725	£0
2004–05	165	3	£48,257		£7,375,500	£0

ENGINEERING DOCTORATE

<i>FY</i>	<i>Taken-up</i>	<i>Award duration in years</i>	<i>Unit cost £</i>	<i>Minimum Industrial Contribution</i>	<i>Cost to EPSRC</i>	<i>Notional cost to industrial partners</i>
2001–02	135	4	£67,758		£9,147,330	£0
2002–03	145	4	£70,981		£9,824,910	£0
2003–04	145	4	£73,304		£10,292,245	£0
2004–05	145	4	£81,000		£10,629,080	£0
2005–06	165	4	£84,148		£13,884,420	£0

Notes:

1. Industrial partners for CNAА (from 2005) and Industrial Case Awards (from 2002) were required to contribute a minimum of a third of the EPSRC unit cost to the department and the mandatory contribution to the student ceased.
2. Unit cost consists of Fees, National minimum stipend and incidental costs.

Table B
EPSRC SUPPORT FOR CASE

<i>FY</i>	<i>Industrial Case</i>	<i>Case for New Academics</i>	<i>Maths Case</i>	<i>Collab DTG</i>	<i>EngDoc</i>	<i>Total</i>
2001–02	£8,884,047	£2,745,288	£800,709	£4,346,706	£9,147,330	£25,924,080
2002–03	£9,480,350	£3,721,625	£1,136,075	£7,244,510	£9,824,910	£31,407,470
2003–04	£14,214,600	£3,441,900	£894,000	£7,325,725	£10,292,245	£36,168,470
2004–05	£15,587,011	£5,234,064	£965,140	£7,375,500	£10,629,080	£39,790,795
2005–06	£15,282,248	£4,994,976	£1,189,280		£13,884,420	

<i>FY</i>	<i>Industrial Case no.students</i>	<i>Case for New Academics no.students</i>	<i>Maths Case no.students</i>	<i>Collab DTG no.students</i>	<i>EngDoc no.students</i>	<i>Total no.students</i>
2001–02	233	72	21	114	135	575
2002–03	242	95	29	190	145	701
2003–04	318	77	20	187	145	747
2004–05	323	92	20	165	145	745
2005–06	257	84	20		165	

Table C
FIRST EMPLOYMENT DESTINATIONS OF CASE

FIRST EMPLOYMENT DESTINATIONS OF CASE SCHEME AND ENGINEERING DOCTORATE STUDENTS FROM SURVEYS IN YEARS 2000–04

<i>Industrial Case</i>	<i>2000</i>	<i>2001</i>	<i>2002</i>	<i>2003</i>	<i>2004</i>
Academic Sector (Fixed & Permanent Academic Appointments)	19	26	21	32	29
Private Sector, Industry or Commerce	30	38	34	27	29
Other Employment	3	5	7	8	4
Total known employed destinations (excludes not employed, further training and writing up)	52	69	62	67	62
Case for New Academics					
Academic Sector (Fixed & Permanent Academic Appointments)		1	9	6	8
Private Sector, Industry or Commerce		1	4	11	11
Other Employment		1	1	2	4
Total known employed destinations (excludes not employed, further training and writing up)		3	14	19	23

Note: CNAА Scheme introduced in 2001

<i>Industrial Case</i>	<i>2000</i>	<i>2001</i>	<i>2002</i>	<i>2003</i>	<i>2004</i>
Mathematics CASE					
Academic Sector (Fixed & Permanent Academic Appointments)	4	4	3	2	3
Private Sector, Industry or Commerce	5	2	6	6	5
Other Employment	1		2	1	3
Total known employed destinations (excludes not employed, further training and writing up)	10	6	11	9	11
Standard Case (Collaborative Doctoral Training Grant)					
Academic Sector (Fixed & Permanent Academic Appointments)	12	5	0	0	1
Private Sector, Industry or Commerce	29	5	0	1	1
Other Employment	7	0	3	0	0
Total known employed destinations (excludes not employed, further training and writing up)	48	10	3	1	2
Engineering Doctorate					
Academic Sector (Fixed & Permanent Academic Appointments)	4	3	4	4	6
Private Sector, Industry or Commerce	21	29	22	19	18
Other Employment	1	5	3	2	4
Total known employed destinations (excludes not employed, further training and writing up)	26	37	29	25	28

Note: EPSRC moved in 2003 to using the Higher Education Statistical Agency (HESA) to collect the First Destinations data. HESA data relies on people responding to surveys and therefore the data we have does not represent the full picture.

HESA and the Research Councils (RC) are currently exploring ways of increasing the record return response for the RC population from the Destination of Leavers from Higher Education Survey.

Annex 5

Economic and Social Research Council

ESRC annual spend on CASE is currently about £3 million, based on figures for 2005–06. A spreadsheet is attached under separate cover (ESRC CASE figures) which summarises the details of CASE awards since 1999.

Unfortunately the previous employment destinations surveys and the survey now carried out by HESA on behalf of the Councils do not allow ESRC to identify CASE students separately. ESRC cannot, at present, provide aggregate data on employment sectors although table A below does provide a breakdown of the awards by sector. ESRC has however carried out a number of individual case studies having followed up some of our CASE students. These are also attached under separate cover.

Some other relevant points:

The CASE scheme only tells part of the picture regarding collaborative research training and knowledge transfer activities at the doctoral level. ESRC also funds a number of studentships in partnership with government departments and the devolved administrations.

ESRC has recently carried out a review of some of its KT schemes and therefore have some material on student and supervisor satisfaction but have not been able to synthesise this in the time available. ESRC could provide further information on this in the next few weeks if required.

<i>APPLICATIONS/ AWARDS</i>	<i>YEAR</i>						<i>TOTAL</i>
	<i>1999</i>	<i>2000</i>	<i>2001</i>	<i>2002</i>	<i>2003</i>	<i>2004</i>	<i>2005</i>
Number of Applications	113	90	136	128	110		577
Number of Awards							
Commissioned	64% (72)	66% (59)	56% (76)	57% (73)	52% (57)		58% (337)
Number of Awards							
Terminated	21% (15)	15% (9)	18% (14)	10% (7)	2% (1)		14% (46)
AGE PROFILE (STUDENT)							
22–25 years old	0% (0)	5% (3)	13% (10)	29% (21)	39% (22)		17% (56)
26–30 years old	31% (22)	39% (23)	37% (28)	34% (25)	28% (16)		34% (114)
31–40 years old	42% (30)	37% (22)	32% (24)	25% (18)	16% (9)		31% (103)
41–50 years old	21% (15)	8% (5)	14% (11)	10% (7)	14% (8)		14% (46)

[illegible]

APPLICATIONS/AWARDS	2000	2001	2002	2003	2004	2005	TOTAL	% increase	2006	2007
Number of Applications	90	136	128	110	114	171	749			
Number of Awards Commissioned	59	76	73	57	66	85	416			
Number of Awards Commissioned %	66	56	57	52	58	50	56			
London Awards %	10	18	18	12	15	15	15			
London Awards	6	14	13	7	10	13	62			
Tuition Fees	2740	2806	2870	2940	3010	3085	17451	2.491694	3161.869	3240.653
Maintenance Grant	7372.18	9250	10300	11000	13300	16000	67222.18	20.30075	19248.12	23155.63
RTSG	460	460	480	750	750	750	3650		750	750
Total Stipends and Allowances	10572.18	12516	13650	14690	17060	19835	88323.18		23159.99	27146.29
Value of Awards	216755	558910	596556	352841	594544	894301	3213908			
Elsewhere Awards %	90	82	82	88	85	85	85			
Elsewhere Awards	53	62	60	50	56	72	354			
Tuition Fees	2740	2806	2870	2940	3010	3085	17451	2.491694	3161.869	3240.653
Maintenance Grant	5707.965	7500	8300	9000	11300	14000	55807.96	23.89381	17345.13	21489.54
RTSG	460	460	480	750	750	750	3650		750	750
Total Stipends and Allowances	8907.965	10766	11650	12690	15060	17835	76908.96		21257	25480.2
Value of Awards	1663303	2187806	2358484	2286544	3037927	4665341	16199405			
TOTAL VALUE OF AWARDS	1880058	2746716	2955040	2639385	3632472	5559643	19413313			
<i>COLLABORATING PARTNER % of awards</i>										
Commercial Organisation %	23	33	19	19	24	24	24			
Public Sector %	52	53	62	65	57	57	57			
Voluntary Sector %	17	10	15	9	14	14	14			
n/a %	8	4	4	7	5	5	5			
<i>COLLABORATING PARTNER value of awards</i>										
Commercial Organisation	432413	906416	561458	501483	871793	1334314	4659195			
Public Sector	977630	1455759	1832125	1715600	2070509	3168996	11065588			
Voluntary Sector	319610	274672	443256	237545	508546	778350	2717864			
n/a	150405	109869	118202	184757	181624	277982	970666			

Medical Research Council

Expenditure on Industrial CASE studentships is as follows:

	2004–05	2005–06 (estimated)
Industrial CASE studentships	£400,000	£400,000

Due to unforeseen circumstances MRC have only been able to provide the limited information above by the deadline 18 April. However MRC can provide further information by 21 April if required.

MRC INFORMATION REGARDING CASE STUDENTSHIPS—HOUSE OF COMMONS SCIENCE AND TECHNOLOGY COMMITTEE INQUIRY INTO RESEARCH COUNCIL SUPPORT FOR KNOWLEDGE TRANSFER 2006

1. Cost of Awards to MRC and host companies since 2000

Overall new commitment to CASE awards from 2000–03 is as follows:

<i>Financial Year</i>	<i>MRC commitment to new awards* (£k)</i>	<i>Company commitment to new awards** (£k)</i>
2000–01	2,088	819
2001–02	2,356	924
2002–03	2,302	903
2003–04	1,232	693

* These figures are estimated based on the average cost of a studentship and data on the number of new studentships funded.

** These figures are estimated based on the minimum direct financial contribution required from the company to the student (£2k pa stipend enhancement), and to the university department involved (£4k pa to contribute to research costs).

In 2004–05, 10 MRC Industrial Collaborative studentships were awarded, with an estimated new commitment of £535k from the MRC and at least £210k from industrial partners.

Since October 2004 the majority of MRC funding for PhD studentships, including funding for CASE studentships, has been awarded to Universities through Doctoral Training Accounts. Universities now have much greater freedom to set up collaborative funding arrangements for studentships with MRC funding. Arrangements can be negotiated locally, and can involve either private sector or charitable funding partners. Data on the number of collaborative studentships with industrial partners awarded by Universities from their Doctoral Training Account funding, the level of commitment from funding partners, and the industrial companies involved are not yet available (see Section 2).

SECTOR OF INDUSTRIAL PARTNER:

The majority of industrial partners in MRC studentships come from the Pharmaceutical and Biotechnology sectors.

2. Number of Awards since 2000

<i>Financial Year</i>	<i>Collaborative awards</i>	<i>Industrial collaborative</i>	<i>Total MRC Studentships</i>
2000–01	15	24	404
2001–02	25	19	404
2002–03	20	23	392
2003–04	11	12	404

In 2004–05, 10 Industrial Collaborative studentships were awarded. Accurate data on the overall number of studentships and the number of collaborative studentships supported by universities from their MRC Doctoral Training Accounts are not yet available. Initial problems with collection of data on students funded via this new funding mechanism are currently being addressed.

3. *Data on the impact of CASE since 2000*

The first destination data on students completing studentships collected by the MRC is not broken down by type of PhD studentship award. The following data shows the breakdown of first employment destination across all studentships, as returned annually to OST:

<i>Year degree started</i>	<i>1997–98</i>	<i>1998–99</i>	<i>1999–2000*</i>
Total number of leavers	430	401	423
of which, destination known	370	247	269
Known destinations	%	%	%
Permanent academic employment	0.8	2.0	1.9
Fixed-term academic employment	40.3	40.9	39.0
Further training (excl. teaching)	4.6	8.5	7.1
School teaching or teacher training	1.4	0.0	0.0
<i>Private sector, industry or commerce</i>	11.1	13.8	14.5
Government or other public sector	5.9	4.5	3.0
Other employment	12.2	6.9	7.4
Not employed	4.9	7.3	10.0
Overseas	18.9	16.2	17.1

* For starters from 2000 onwards, data are collected on behalf of all research councils by the Higher Education Statistics Agency.

4. *Additional Impact*

MRC does not have data available on any additional types of impact such as continuing relationships or ongoing collaboration arising from the schemes.

5. *Differences between how Councils administer schemes*

MRC currently supports Collaborative studentships in two different ways. Both schemes seek to enhance links between academia and industry in the provision of high quality research training, and in each scheme students are jointly supervised by an academic and an industrial supervisor. Students are based at a University department or Research Institute, but can expect to spend a minimum period of three months during the tenure of the award with the collaborating industrial company. As a measure of its interest and involvement, the industrial company is expected to make a financial contribution to the cost of the studentship.

Industrial Collaborative Studentships: These studentships are awarded via an annual competition managed centrally by MRC Head Office, with the industrial partner as the primary applicant. The industrial partner takes the initiative in establishing the academic link.

Collaborative Studentships: Under this scheme, the academic partner defines the research project and takes the initiative in establishing a link with an industrial company and supervisor. There is no annual competition and the MRC contribution to awards is funded from the academic host institution’s Doctoral Training Account.

6. *Satisfaction Rates for the Studentships*

MRC has no current information on satisfaction rates for collaborative or industrial collaborative PhD studentships.

Annex 7

NATURAL ENVIRONMENT RESEARCH COUNCIL

CASE STUDENTSHIPS

NERC CASE Partners can be from industry, Government, private or public sector companies based in the UK or overseas.

<i>Year</i>	<i>2000</i>	<i>2001</i>	<i>2002</i>	<i>2003</i>	<i>2004</i>	<i>2005</i>
New CASE students	90	74	108	106	104	99
Stock CASE students	298	268	268	299	319	307
% total PhD students	27%	26%	26%	29%	32%	30%
Cost to NERC for CASE students	£3m	£3.2m	£3.9m	£4.6m	£5.2m	£5.4m

Year	2000	2001	2002	2003	2004	2005
Minimum cost to CASE Partners *	£0.3m	£0.27m	£0.27	£0.3m	£0.32m	£0.3m
% of CASE Partners that are Industry or Private Sector **	37%	34%	38%	31%	37%	27%

* based on the CASE Partner having to pay the student at least £1,000 per year. The CASE partner may pay a higher contribution to the student or contribute either in cash or in kind to project costs, but we don't collect those data electronically.

** based on the studentships starting in that year. The remaining CASE Partners were classified as Government or public sector. Unfortunately we are not able to provide details of industrial sector in the time available.

NERC is unable to provide destination data specifically regarding CASE Students. The table below shows the NERC data for destinations for all our PhD students.

Year finished	1998-99	1999-2000	2000-01	2001-02	2002-03	2003-04
Industrial sector*	17%	10%	6%	8%	9%	9%
Academic Sector**	25%	21%	12%	22%	25%	16%
Other employment***	10%	18%	11%	9%	8%	8%
Remainder ****	48%	51%	71%	61%	58%	67%

* Industrial sector includes those classified as private sector, industry or commerce

** Academic sector includes those classified as Permanent Academic and Fixed Term Academic

*** Other includes school teaching or teacher training; Government or public sector; other employment

**** Remainder includes all other categories: further training; not employed; unknown (average around 40% of total are unknown)

NERC has no data on any continuing relationships or collaborative work generated by the scheme.

NERC RUNS TWO MECHANISMS FOR CASE STUDENTSHIPS:

- (a) Any of our PhD studentships can be awarded as a CASE studentship, where there is involvement by a non-university partner fulfilling the minimum requirements (time spent in the CASE Partner and at least £1k per year from the CASE Partner to the student). NERC awards around 250 PhD studentships per year through an algorithm and we expect around 30% of them to be set up as a CASE awards.
- (b) A separate competition is held once a year. This was called the Industrial CASE competition, but has now been widened to other UK public sector partners and is called the Open CASE competition. In 2005 around 150 applications were received and reviewed by a panel and 35 studentships were awarded. Previously the scheme had funded 20 new studentships per year.

IN RELATION TO SATISFACTION RATES, NERC PROVIDES THE FOLLOWING:

Submission data for all our PhD students show that around 80% of NERC funded students submit their PhD thesis within four years;

A NERC survey in 2004 of interactions between NERC-funded researchers and their users showed that 70% of the consulted users had been involved in joint training projects such as CASE PhD studentships. Of the identified methods of knowledge transfer, users were most satisfied with the quality of PhD training provision (though this did not separate CASE from standard PhD studentships). 95% of respondents said they would consider being involved in CASE again.

Particle Physics and Astronomy Research Council

CASE STUDENTSHIPS: COSTS AND NUMBER OF AWARDS

We have taken costs to mean the funds spent by Research Councils and industry on CASE studentships each year. Industries have been categorised by broad market sectors. We have given numbers for total student stock to show the proportion of CASE against the whole studentships programme. Detailed in following table:

<i>Expenditure by PPARC on CASE awards</i>	<i>Total Expenditure by Industrial Partners</i>	<i>Public Sector</i>	<i>Defence</i>	<i>Instrument</i>	<i>Hardware/Software</i>	<i>Health</i>
2000–01 £343,500	£97,500	£42,900	£15,600	£35,100	£0	£3,900
2001–02 £368,000	£111,860	£59,925	£19,975	£27,965	£0	£3,995
2002–03 £376,715	£107,865	£51,935	£31,960	£7,990	£11,985	£3,995
2003–04 £325,735	£110,565	£61,425	£28,665	£4,095	£12,285	£4,095
2004–05 £421,553	£109,200	£50,400	£21,000	£8,400	£25,200	£4,200

NUMBER OF CASE AWARDS

	<i>Stock</i>	<i>Total Studentships</i>	<i>New CASE Awards</i>	<i>New CASE-Plus Awards</i>
2000–01	25	524	9	1
2001–02	28	543	6	2
2002–03	27	564	7	2
2003–04	27	577	8	2
2004–05	26	596	7	1

IMPACT OF CASE

PPARC does not have information on how many CASE students go on to work in the industrial research sector. We have information (DHLE data) on the destination of postgraduate leavers funded by PPARC however this data does not identify CASE students as a separate category. The DHLE data shows that over the period 2000 to 2003–04, 22% of students took up employment in the private sector.

We can provide additional information from a 2003 Career Path Survey of former PPARC PhDs whose PhDs ended between 1995–96 and 1998–99. This survey data showed that six to eight months after finishing their PhDs, 48% of former students were employed in the private sector. Of those employed in private companies 75% worked in financial services, business services and computer software design, solutions and management.

The 2003 survey sample of 186 respondents included 10 students who had held CASE awards. The collaborating bodies on these CASE awards were in the areas of defence and aerospace, supply of goods and services for scientific research, natural resources and environment, computing and public sector research.

The DHLE data shows that 40% of PPARC postgraduate leavers were employed in academic research and 60% were employed in other sectors.

The 2003 career path survey showed that 35% of former students were employed in universities and 12% were employed in other Government and public organisations.

ADDITIONAL IMPACT

We can provide information from the 2003 Career Path Survey on career paths of CASE students, though it is worth noting that this is a very small sample. Six out of the 10 CASE students had collaborated with the organisation that had sponsored their CASE studentship, although four of them worked for someone else. Two still worked for their CASE collaborator.

PPARC developed a CASE -Plus scheme in 1999–2000. This was an extension of CASE to help students become more effective in prioritising technology transfer: CASE-Plus operates the same way as CASE for the first three years CASE -Plus students then go onto spend a fourth year working full-time as an employee of the co-operating body. During the fourth year the student receives a salary equivalent to that of new postdoctoral researchers, this is jointly funded by PPARC and the industry employer. There have been eight CASE-Plus awards to date.

ADMINISTRATION OF SCHEMES

CASE and CASE-Plus applications are peer reviewed by a CASE Panel of four members. Applications are assessed against the criteria below:

1. scientific quality and value of the project;
2. educational value to the student;
3. novelty of the idea;
4. strength of industrial collaboration; and
5. impact on wealth creation and quality of life.

CASE Panel Members are asked to score each criterion. The first three criteria merit a maximum of 10 marks, whilst the last two merit up to 15 marks each. Thus a weighting is placed on the criteria relating directly to collaboration with industry and technology transfer.

SATISFACTION RATES

PPARC does not have this data but drawing again on the 2003 survey—the vast majority of those surveyed were “very happy” (42%) or “quite happy” (50%) with their current employment. Submission rates for PPARC studentships including CASE have been at least 80% each year.

ADDITIONAL PPARC COMMENTS

Whilst CASE studentships constitute a small proportion of our overall studentship numbers, we consider the CASE scheme to be an important part of the package (along with the PIPPS schemes, KITE Club and other awards) that we provide to facilitate links between our researchers and industry.

House of Commons S&T Committee Inquiry

INFORMATION IN RELATION TO CONNECT A & B/PARTNERSHIP RESEARCH GRANTS

The Natural Environment Research Council has been running these schemes since 1995–1996 (note: In December 2005 Connect B was replaced by Partnership Research Grants). The Committee would like to see information that will help to answer questions such as:

- how many applications have been received for each scheme per annum; and what advertising is undertaken to promote the schemes to research bodies and industry?;
- how many grants have been made each year, and what was the total value?;
- what were the total annual costs of running the schemes? and
- what steps are taken to measure the effectiveness of these schemes in supporting knowledge transfer?

For numbers of applications, numbers of grants and total value of grants, please see next page. We apologise for the gaps in the data, but not all has been obtainable in the time available.

The schemes are advertised in NERC’s Research Grants Handbook and on the website, and in the e-Newsletter Using NERC Science.

For example, details of Connect A in the 2005 Handbook are as follows:

This scheme is aimed at promoting partnerships between eligible researchers (under rules for Blue Skies, see Section C) and potential users of NERC funded research. The scheme is intended for pump priming activities of two basic types: “Proof of concept” proposals for a specific research activity relating to emerging ideas from the science base that have potential application but a high degree of technical risk and costs for workshops or seminars on a theme of joint interest to the collaborating body and the science base. Participants should be from both communities. The maximum funding that may be sought is £4,000 for the total Directly Incurred costs (ie the limit applies to 100% of costs under this heading). In addition NERC will pay the appropriate proportion (ie 80%) of Directly Allocated and Indirect Costs (see Section D for details of cost categories).

There are no closing dates for CONNECT A applications. Applications should be submitted on the Connect A application form available from the NERC website and NOT through the Je-S system. The costs of running the scheme are considered along with the costs of administering NERC’s Standard Grants Scheme, and form a very small part thereof.

The effectiveness of the schemes in supporting knowledge transfer is assessed annually by means of Output and Performance Measures (OPMs) during the life of the projects and for three years afterwards (this is likely to be increased to five years).

NERC CONNECT RESEARCH GRANTS AWARDED 1995–96 to 2005–06

	1995–96	1996–97	1997–98	1998–99	1999–2000	2000–01	2001–02	2002–03	2003–04	2004–05	2005–06
CONNECT A											
Applications	3	9	3	3	3	9	9	1	5	4	3
New Awards	4	7	1	2	2	7	6	1	5	1	1
Value New Awards (£k)	21	34	5	10	9	32	35	3.4	27	5	5

	1995-96	1996-97	1997-98	1998-99	1999-2000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
CONNECT B											
Applications	n/a	n/a	n/a	11	7	8	7	6	8	10	4*
New Awards	5	5	7	5	0	2	9	5	5	2	3
Value New Awards (£k)	429	413	1,189	539	0	142	655	1,008	437	249	733

Notes:

All figures are based on financial year.

Applications are shown in the financial year in which they were received; new awards are shown in the financial year in which the grant was awarded and became active.

* These applications are now called Partnership Research Grants not Connect B.

OUTPUT AND PERFORMANCE MEASURES

www.nerc.ac.uk/evaluation/opm/

This year Central Government will spend around £370 million of the UK Science Budget on the environmental sciences through NERC. Council and the Office of Science and Technology (OST) need to be assured that NERC is supporting excellent science and training and providing best value for money.

Output and Performance Measures (OPMs) are one of the tools used by OST, NERC Council and its Science & Technology Board to help assess the delivery of this mission; and in priority setting, resource allocation and the management of programmes.

We believe that in order to make the most effective use of OPMs at an organisational level it is important that their collection and use forms an integral part of the overall strategic planning process.

Data on many of the indicators are held centrally within Swindon Office. In addition, information on research outputs is collected annually from current and previous grant holders and from our research centres, Designated Data Centres and Services & Facilities. In 2003 we introduced electronic collection by Research Outputs Database (ROD).

This OPM information is collated into a report for Council, and the data are analysed in detail, where possible drawing on studies carried out by other funding bodies.

Data and information collected via the OPM exercise also feed into the NERC Annual Report, and were used in the development of NERC's Science Strategy and for Science & Management Audits of NERC Research Centres. Examples of science achievements or exploitation are always needed for briefings and speeches, and may be written up as articles in "Planet Earth".

In addition, all Research Councils are required to report annually to the Office of Science and Technology on an agreed set of indicators. These are used to demonstrate progress in the key areas of research, training, industrial competitiveness and the promotion of science.

These data are a sub-set of the OPMs collected for NERC Council, and include details of publications; major scientific achievements; training and partnership awards; public engagement and public understanding of science initiatives; and science into policy.

SELECTED INFORMATION ON OPMs FROM CONNECT A AND B SCHEMES, 2002-05

— to give an idea of the sort of information recorded, and the success of the schemes.

It should be noted that data in OPMs may not cover all research outputs because of incomplete reporting.

Publications information

Information on publications includes papers (refereed and other) in journals; books; book chapters; and other non-refereed publications.

eg Research Publications in ISI Journals (from ROD database)

Programme	2002	2003	2004	2005
Connect A	1	5	1	1
Connect B	24	14	6	11
Knowledge Transfer*			9	13

* The Knowledge Transfer (KT) scheme was introduced in 2004; it includes Connect B, Good Ideas, and Networks, therefore the figures against KT cannot be attributed only to Connect B. Reports on Connect projects are submitted for three years following the end of the award, therefore in 2004 and 2005 the publications against Connect B relate to publications from previous years' awards.

IPR information

Data on patents and IPR income, eg from licensing, are also collected. Such data are likely to appear in OPMs well after the year of the award. eg:

2002–03 OPM

An HEI filed an international patent application concerning personal-care compositions from work on a Connect A project looking at UV-absorbing compounds from algae.

In HEI filed a UK patent application for a marine-mammal phone-tagging system as a result of work on a Connect B project, and another sold products or services related to a Connect B project on seabed monitoring.

2003–04 OPM

An HEI sold products or services developed during a Connect A project on the application of geophysics to contaminated land.

2004–05 OPM

An HEI sold products or services related to work on a Connect B project investigating new platforms for oceanographic monitoring.

2005–06 OPM

Three HEIs sold products or services related to work on Connect B projects.

Scientific achievements information

This is wide-ranging, eg (far from a complete list) development of new sampling, detection or recording technologies; manufacture of prototypes; improved understanding of natural phenomena or processes; provision of information relevant to environmental management or protection, eg identification of pollutant sources or environmental indicators; new computer models; securement of a book contract; development of an internet information resource/network.

Science-to-Policy information

This covers the provision of policy information to government departments and agencies (eg the EA), including information on agriculture and food, biodiversity, environmental change and impacts, environmental technology, land use, natural resources, nature conservation, planning, pollution, waste, and water. Grantholders are asked to say how and to whom they communicated their information or advice.

Prizes

Grantholders are also asked to record the receipt of prizes related to their scientific achievements.

Connect A & B:

HEI RECIPIENTS AND PROJECT PARTNERS

CONNECT A: 2001–06

<i>HEI</i>	<i>Partner 1</i>	<i>Partner 2 (if applicable)</i>	<i>Partner 3 (if applicable)</i>
Brunel University	World Wildlife Fund	International Snow Leopard Trust	
Cardiff University	Countryside Council for Wales		
Centre for Ecology and Hydrology	Health Protection Agency		
Proudman Oceanographic Laboratory	Partrac Ltd		
Royal Holloway, University of London	Compass Hydrographic Services Ltd		
University of Bimingham	Subsurface Geotechnical Ltd		
University of Leeds	English Heritage	City of York Council	
University of Manchester	European Mercury Emissions from Chlor-Alkali Plants		
University of Newcastle upon Tyne	European Science Foundation		

<i>HEI</i>	<i>Partner 1</i>	<i>Partner 2 (if applicable)</i>	<i>Partner 3 (if applicable)</i>
University of Sheffield University of Sheffield	Highspy Ltd [data not available at short notice]		
University of Southampton University of Southampton University of St Andrews University of St Andrews	BP National Trust Partrac Ltd NSF	Subsea 7	Transocean

CONNECT B: 2001–06

<i>HEI</i>	<i>Partner 1</i>	<i>Partner 2 (if applicable)</i>	<i>Partner 3 (if applicable)</i>	<i>Partner 4 (if applicable)</i>
Centre for Ecology and Hydrology Imperial College London Kings College London Queen Mary's University of London Reading University Reading University Scottish Association for Marine Science (SAMS) SAMS The Natural History Museum University of Durham University of Edinburgh University of Edinburgh University of Essex	Geovista Ltd Rio Tinto Environment Agency HR Wallingford Meteorology Office Syngenta Conoco (UK) Ltd Yeoman Morvern Limited PDM Group Environment Agency Defra Meteorology Office Meteorology Office	Canadian Geological Service RMC Aggregates Harwich Haven Authority Astrazeneca Geotek Ltd Eden Rivers Trust Environment Agency	Defra United Utilities	Radio Communications Agency
University of Lancaster University of Leeds University of Leeds	Environment Agency Environment Agency National Trust	Yorkshire Water Environment Agency		
University of Leicester	Electro-silica, Oil and Gas Ltd			
University of Liverpool	DSTL			
University of St Andrews	Wildtrack Telemetry Systems Ltd			
University of St Andrews	United States Department of Commerce, National Marine Fisheries Service			
University of Wales, Bangor	DSTL			

April 2006

APPENDIX 23

Supplementary memorandum from Research Councils UK

EXTERNAL REVIEW OF RESEARCH COUNCIL KNOWLEDGE TRANSFER PLANS AND GOALS

I am pleased to provide the House of Commons Science and Technology Select Committee with an advance copy of the draft report of the “External Review of Research Council Knowledge Transfer Plans and Goals” (not printed). The draft report was circulated to the members of the panel engaged in the review and to the Research Councils on 23 March, and as such is provided “in confidence” whilst panel members provide their final comments and sign off. As such, you will note that the report contains a number of tracked changes—these are factual points which the Councils have requested are amended in the final version.

We are undertaking a detailed consideration of the findings and recommendations and anticipate publishing both the report and our response in due course.

BACKGROUND

This independent report was commissioned by RCUK to assist the Research Councils in refining their innovation activities, by providing critique of individual Councils’ current and planned knowledge transfer activities. In particular, the aim was to identify examples of good practice and areas for further development, taking account of the breadth of research undertaken by each Council, the characteristics of their user communities and the resources available. The terms of reference, details of the scrutiny process and panel membership are given in the report.

INITIAL RESEARCH COUNCILS' VIEWS ON THE EXTERNAL REVIEW REPORT

The report has been seen by Research Council Chief Executives and their knowledge transfer teams. The Research Councils are grateful for the time, commitment and effort of the panel members in voluntarily undertaking this review of Councils' knowledge transfer activities. The resulting report contains much for the Research Councils to consider, both individually and collectively.

This is the first time that such a review has been undertaken and lessons have been learned for future exercises. Designed as a relatively simple and light touch activity, the Councils agree with the review panel that the process had its practical limitations, not least in terms of the time available to provide additional evidence and to weigh this evidence in forming conclusions.

The initial views of the research councils on the report are as follows:

(i) The primary purpose of this exercise was to provide the Research Councils with constructive feedback on their knowledge transfer plans and goals. By focusing instead on the wider economic agenda and the role of HEIs in knowledge transfer, the resulting report conveys a less comprehensive assessment of Councils' activities than anticipated. Councils would have valued more feedback on current activities and the planned utilisation of additional funding made available from April 2006. The wider issue of the impact of the Science Base on innovation and productivity is being addressed through a specific working group on economic impact, which will report to the DGRC.

(ii) Notwithstanding intellectual arguments about the scope of "knowledge transfer", the Councils believe that their common definition of knowledge transfer provided a clear framework within which the review should have been conducted. Science in Society activities, such as engagement with the general public and with schools, were explicitly out-with the scope of this review and it should be noted that any commentary on this area of activity is made without the benefit of evidence from the Councils.

(iii) The report comments on an apparent lack of long term vision and goals for knowledge transfer at the highest strategic level. We find this statement surprising, given that each Council has an explicit responsibility for knowledge transfer in their Missions, and that all have clear, top-level objectives in their delivery plans—agreed by their Councils—including specific metrics for measuring progress towards "better exploitation". This information was provided to the panel.

(iv) The Research Councils believe that research and knowledge transfer are integrated activities. The engagement of potential end users in setting overall strategic direction, in shaping research priorities and programmes, and in co-funding or collaborating on research is as important a means of knowledge transfer as mechanisms aimed at exploiting research outputs. We believe that there is insufficient recognition of this throughout the report.

(v) The Councils refute entirely the findings that end-users are "marginalised in the funding process and only engaged once funding decisions are taken" and that "most Council investments fit with the needs of industry by serendipity". All of the Research Councils have strong user representation on their Councils and advisory bodies, and most have specific industry or user advisory panels. All work with potential end users in developing programme activities, all employ end-users on their peer review colleges and panels, and all support research in partnership with users as joint funders or collaborators. The written evidence provided to the Committee on 16 February provides comprehensive information on user engagement and successful exploitation by industry.

(vi) In a number of places, the report states that that balance between academic push and industry pull is far too much towards "push" and recommends that the solution is to transfer funding from basic, blue skies research into end-user managed programmes. The Research Councils believe that these statements reflect the personal views of several panel members, and have been unable to ascertain on what evidence such comments are based. The Research Councils have extensive advice from the business members of their advisory groups that what industrial users want is for the Councils to maintain a broad, healthy research base through investment in world-class blue skies research and training highly skilled people, which in turn, underpins their own business R&D activities.

(vii) The breadth and diversity of Research Council's user communities mirror their research portfolios. End users of research include policy makers in Whitehall, the regions, Europe and internationally, and those in many other parts of the public sector such as the NHS, Met Office and museums and galleries, as well as business in all of its guises from SMEs to global companies. The transfer of knowledge to all of these users, directly or indirectly, delivers economic benefit. As such, the Councils are disappointed that the report focuses extensively on technology transfer and commercialisation and does not explore sufficiently knowledge transfer to other primary users.

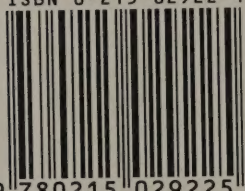
(viii) The report recommends that as funders, the Research Councils should take a more direct role in ensuring that universities manage and exploit their research to meet the needs of industry. Whilst the Councils do have a responsibility for helping to create the climate and culture in HEIs to enable this to happen (eg by providing specific funding or pressing for the RAE to give due weight to this type of activity), we believe that direct intervention is undesirable. This view is supported by the Funding Councils, UUK and the universities themselves, who believe that these responsibilities, particularly the exploitation of

intellectual property, should reside with the university in question. Ultimately, the Research Councils, HEIs, DTI and users need to work together in a coordinated way to achieve successful knowledge transfer and exploitation.

May 2006

Wellcome Library

ISBN 0-215-02922-4



9 780215 029225

Distributed by TSO (The Stationery Office)

and available from:

TSO

(Mail, telephone and fax orders only)

PO Box 29, Norwich NR3 1GN

General enquiries 0870 600 5522

Order through the Parliamentary Hotline *Lo-call* 0845 7 023474

Fax orders 0870 600 5533

Email book.orders@tso.co.uk

Internet <http://www.tsoshop.co.uk>

TSO Shops

123 Kingsway, London WC2B 6PQ

020 7242 6393 Fax 020 7242 6394

68-69 Bull Street, Birmingham B4 6AD

0121 236 9696 Fax 0121 236 9699

9-21 Princess Street, Manchester M60 8AS

0161 834 7201 Fax 0161 833 0634

16 Arthur Street, Belfast BT1 4GD

028 9023 8451 Fax 028 9023 5401

18-19 High Street, Cardiff CF10 1PT

029 2039 5548 Fax 029 2038 4347

71 Lothian Road, Edinburgh EH3 9AZ

0870 606 5566 Fax 0870 606 5588

The Parliamentary Bookshop

12 Bridge Street, Parliament Square

London SW1A 2JX

Telephone orders 020 7219 3890

General enquiries 020 7219 3890

Fax orders 020 7219 3866

Accredited Agents

(See Yellow Pages)

and through good booksellers

© *Parliamentary Copyright House of Commons* 2006

Applications for reproduction should be made in writing to The Licensing Division,

HMSO, St Clements House, 2-16 Colegate, Norwich NR3 1BQ

– Fax 01603 723000

ISBN 0 215 02922 4